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## British Association of Gas Managers.

PRESIDENT'S ADDRESS.

[From the able address of Mr. Livesey we extract such passages as we deem likely to be of especial interest to our readers, regretting that much must be omitted.—ED.]

We come next in order to the substitutes for the dip in the hydraulic main. Opinions are divided on the desirability or the necessity for such inventions. It is an undoubted and undisputed fact that pressure to any extent in the retort is in every way objectionable. It was the discovery by Mr. Grafton that this was the principal cause of the deposition of carbon in the retort that led to the introduction of the exhauster, even before clay retorts came into general use; and, now that they are used, it becomes more necessary than ever that the pressure should be removed or reduced to a minimum, for, in addition to the deposition of carbon, with all its attendant evils, there is the loss by leakage through the pores or cracks of the retort to be prevented. Many contend that the exhauster alone meets the difficulty: that by its means any desired condition as to pressure in the retort may be attained. This I am not prepared entirely to deny, but all must admit it is very difficult of accomplishment. There are many disturbing causes, and supposing them to be removed, even the action of the dip itself causes a considerable oscillation of pressure in the retort, as shown on a gauge attached to the mouthpiece. Whether the giving the gas a perfectly free passage, and working in the retort at, say from a level gauge to $\frac{3}{4}$-inch pressure—for in no case must a vacuum be permitted—is worth striving for, is quite an open question. If, as some say, by working in this way a largely increased yield of gas is to be obtained, then by all means let us endeavor to accomplish it, provided the cost and trouble of doing so do not counterbalance the advantage to be derived. To make separate mention of all the contrivances that have been brought forward during the past year would only weary you; I shall, therefore, content myself with saying that I consider it desirable such an invention should be self-acting, not liable to get out of order, very simple and inexpensive, capable of ready adaptation to existing apparatus, and one that, should it get out of order, would not interfere with the free passage of the gas. The plan patented by Mr. Hawkins, of Sheffield, displays, perhaps, the greatest novelty of principle; but whether this or any other will be found to perfectly answer the purpose can only be proved by working. I hope that all these inventions will be fairly tried.

While on the subject of the hydraulic, I would briefly draw attention to the advantages of reducing the space below the bottom of the dip, as described in a paper read before the association two years ago. At the South Metropolitan works, all new mains have been constructed on this plan, and all the old ones have had false bottoms put in, with the result that, after three seasons use, there is no accumulation whatever of thick tar; the tar is always fluid, and stopped dip-pipes are unknown. It does not, however, affect stoppages in the ascension-pipes.

Passing from the hydraulic, a considerable amount of attention has been given to the question of condensing, with the result that the opinion is becoming firmly established that in few, if in any works are the condensers of sufficient extent (I do not say of sufficient power). It appears to be necessary, not only to reduce the temperature of the gas, which may be done very effectively by means of water condensers, in a small space and in a short time, but to do it in a certain way, gently and very gradually, and for this purpose a considerable extent of large pipes, exposed to the air, but protected from the sun, seems to be the simplest and cheapest plan. From some experience of this system, to say nothing of the better abstraction of ammonia and, with it, carbonic acid and sulphuretted hydrogen, I believe that more of the illuminating constituents are left in the gas, and less naphthaline is deposited in the mains and services. As a fact on the other side, I may mention that some years ago, having a water condenser of great power but not of great extent, I was advised by an experienced gas maker to turn on a larger quantity of water, in order to cool the gas more rapidly and effectually, with the result that within a fortnight all the mains and connections under the purifiers were completely choked with naphthaline, while neither before nor since has there been any similar effect produced, which I attributed solely and entirely to the sudden cooling of the gas, the temperature having been reduced in about one minute from 120° to 60°, while probably 10 or even 15 minutes would not be too great a time for the cooling of the gas, passing it first through a large air condenser, then through one under water, and finishing in a vessel of large area, to give an opportunity for the deposition of the very fine particles of condensed vapor.

A most forcible illustration of the necessity for ample time in these operations, where mixed gases are concerned, was given in this room by Dr. Odling in 1868, in one of his admirable lectures to this association. He showed a tube filled with pure ammonia gas, which, on being brought into contact with water, was instantly absorbed, the water completely filling the tube. He then experimented with a similar tube, containing 75 per cent. of ammonia gas, mixed with 25 per cent of air, in which the process of absorption went on with exceeding slowness, not being completed even at the close of the lecture.

The next invention to be noticed is Messrs. Pelouze and Audouin's condenser, of which very full descriptions appeared on pages 878 and 1004 of last year's *Journal of Gas-Lighting*. Its object is to overcome a difficulty very commonly experienced—that of arresting the finer particles of tarry vapor, which in many cases, even with good condensation, pass on to the purifiers. It has been found that something more than mere cooling is needed, and hitherto the means adopted or recommended have been either a water-washer or a vessel of large area, through which the gas passes on leaving the condenser. The latter plan, by bringing the gas almost to a state of rest, affords time for the particles of vapor to coalesse and fall, gives very good results, though probably by the use of a washer the work is done more effectively, but there is the drawback of pressure. The new mode of condensing is founded upon the principle that the liquefaction of the globules held in suspension by the gas is brought about by contact of the particles with solid surfaces and with each other. The action is as follows: The gas is made to flow through a series of holes of about 1-16th of an inch in diameter, so forming jets, which strike against a surface placed opposite, at a distance of 1-16th of an inch. In the passage of the gas through the holes, the liquid molecules are brought into close contact with each other, and the action is completed by the contact with the solid surface upon which they strike, where the tarry matter is deposited. It is found to be sufficient to pass the gas through three perforated plates placed very close together, thus giving two surfaces on which the jets of gas strike; and, in order to give the necessary velocity, it is found that a pressure of about five-eighths of an inch is required. The apparatus is undoubtedly very compact, effective and ingenious; but too much was claimed for it. At first it was stated that it removed ammonia, sulphuretted hydrogen, bisulphide of carbon, and naphthaline; but that it did not cause the gas to lose any of its illuminating constituents. A description, with a price list, was sent from France to those interested in gas manufacture. and pasted in it were two test-papers taken at the inlet and outlet, one with a perfectly round black spot, produced by particles of tar, while the other paper was clean. This is all that is now claimed for the apparatus, and this object it appears to accomplish very effectively.

I now come to consider an idea and a system that cannot be called new, but that has received a further development within the past year, whereby its chief remaining difficulty has been overcome, while, owing to the trouble about sulphur, one of the capabilities of the system has been brought prominently forward. I refer to purification by means of ammoniacal liquor. Nearly twenty years ago, Mr. Richard Laming tried at both the Bow Common and the Old Kent Road works to effect the removal of the sulphuretted hydrogen by first depriving the liquor of that impurity by passing it through oxide of iron. The liquor so purified did purify the gas, but nothing was

gained by the plan, seeing that oxide had to be used to absorb the sulphuretted hydrogen, and this not in a direct but in a roundabout, and therefore a more-expensive manner, while a considerable quantity of ammonia was lost. The only good resulting from the experiment was the proof that ammonia purified from sulphuretted hydrogen did purify the gas, and this a great advantage, which served as a stepping stone for further improvement. Thus the matter rested for some years, when Mr. H. Hathaway, now of the Tynemouth Gas Works, in conjunction with myself, worked out a process whereby the liquor was deprived of its sulphuretted hydrogen by means of the waste gases from the furnaces; the sulphuretted hydrogen was, in fact, completely displaced by carbonic acid, end, strange to say, this liquor, which must have consisted of carbonate of ammonia, was found to be capable of greedily absorbing sulphuretted hydrogen from the gas, which was absolutely cleansed from this impurity. The scheme failed, after working the greater part of a year, from the loss of ammonia. At the present time there would be another cause that would render it impracticable—the non-removal of carbonic acid, which is now so clearly proved to stand in the way of effective purification. It may not be here out of place to express my sense of the obligation under which we stand to Mr. Patterson for clearing up this point. It was, of course, known before Mr. Patterson's time that carbonic acid would displace sulphuretted hydrogen from lime; in fact, Mr. William Mann, of the City Gas Works, took out a patent some twenty years ago, for rendering the lime in a fouled purifier innocuous by blowing through it the waste gases from the furnaces, thus, by means of carbonic acid, displacing the sulphuretted hydrogen which was driven off and burnt, but it was not until the sulphur question was brought so prominently into notice by the difficulty experienced at Beckton, that the important part played by carbonic acid as an obstrucive was made clear, and for this knowledge I think we are indebted to Mr. Patterson, who, at a time when all the engineers and chemists were fairly puzzled, collected a vast mass of facts and information, which he acknowledges he freely obtained from the officers of the different gas companies with which he, as referee, had to do, and by much thought and labor in comparing and arranging these statistics, he was led to the conclusion that the presence of carbonic acid was the cause of the failure to effectually reduce the sulphur compounds where lime was used, and what was better (for others may have made the same discovery and have arrived at the same conclusion), Mr. Patterson, in an official report, stated the thing so clearly that no one has since pretended that there is any difficulty in reducing the sulphur compounds where the purifiers are of sufficient extent and it is possible to use lime.

I now return to the liquor. Mr. C. F. Hills, some six years back, patented a plan which, by simply heating the foul liquor, deprived it of its combined $CO_2$, and $SH_2$, producing a rough caustic ammonia, capable of purifying the gas from $SH_2$ as well as $CO_2$ on the necessity for which Mr. Hills laid particular stress. It was found, on making a working experiment, that the purified liquor did its work very effectually; but there was the old difficulty with the ammonia, the loss of which, coupled with the fact that the removal of the $CO_2$ from the gas was not considered of primary importance, led to the abandonment of the experiment, seeing that $SH_2$ could be so cheaply and effectively removed by oxide only. The ammonia apparatus was fortunately left standing at the gas works, and when it became clear that, in order to reduce the sulphur compounds, it was before all things essential to remove the carbonic acid, a further experiment was made. The heating of the liquor was not carried to so great an extent, and simpler means were adopted whereby the expense was reduced, and the loss of ammonia prevented, with the result that by using a liquor not brought quite to the caustic state, the whole of the gas made at the South Metropolitan works has for the last three or four months been deprived of its $CO_2$ to such an extent that, on leaving the scrubbers, there is hardly a trace of this impurity, it taking three minutes before cloudiness in lime water begins, with the gas bubbling rapidly through it. In testing for $CO_2$, care should be taken that the gas is free from $SH_2$, which interferes with the action of the $CO_2$ in the lime water; it is therefore necessary to pass the gas, when $SH_2$ is present, through a little oxide in a small vessel before blowing it through the lime water. Then the test should be closely watched, for the continued application of $CO_2$ dissolves the cloudy precipitate, producing a soluble bicarbonate, and the water again becomes clear. A continuous test is, therefore, impossible.

I am, therefore, decidedly of the opinion that this liquor process of Mr. Hills is by far the simplest, the best, and the cheapest plan for removing $CO_2$ and with it a considerable proportion of the $SH_2$, the small portion left in the gas being taken out by means of a small quantity of lime, which, having no interference from $CO_2$, not only takes out the $SH_2$, but also effectually reduces the sulphur compounds.

This sulphur bugbear has of late made the lives of many gas managers, who have spoken to me on the subject, a perfect burden to them: and I speak feelingly, for it has caused me more annoyance than all other things put together, even in these difficult and anxious times, when we have been so troubled about coal and labor, etc. Last year, even with ample purifiers at the Kent Road, lime could not be used to any considerable extent, owing to the great pressure caused by its hardening by the absorption of carbonic acid, and, besides this, there was the intolerable nuisance of removing and disposing of that which was in the condition of sulphide. I do not like seeing the poor fellows who, to earn their daily bread, are compelled to do such work, breathing the dusty, stinking stuff; and, sometimes when standing in a purifier at such times, I have had the malicious wish that those persons who make such an outcry about sulphur could be compelled to occupy that position only for an hour once a week, until they promised to keep quiet for the future. I venture to say the promise would soon be given. I have no objection, but, on the contrary, should be glad to remove these sulphur compounds—not that I believe they are either perceptible or injurious in any way to the consumer, certainly not to his health, but they are of no certain use in the gas. Therefore, as so much fuss is made about them, they had better be got rid of; but to leave the beautifully perfect system of purifying from $SH_2$ by oxide, and to go back to the barbarism of lime exclusively, is more than I can stand. At the South Metropolitan works is one of the best foremen in England; but, last winter, the anxiety caused by the order of the referees as to sulphur forced him to say, "I cannot stand this; let me retire." The inhabitants of the neighborhood surrounding a gas-work, almost exclusively poor people, ought also to have some consideration on the question of nuisance arising from spent lime. I, therefore, look upon the perfect carrying out of this plan of Mr. Hills with great hope, and believe that, at a small outlay, without additional purifiers, without loss of ammonia and without nuisance, the gas will be purified from $CO_2$, $SH_2$ and the sulphur compounds in a duplicate apparatus on the new plan for treating the liquor.

It is well known that the presence of $CO_2$ in the gas diminishes the illuminating power; it is therefore worth while, on that ground alone, to remove it, though the result of its abstraction by lime alone has not raised the quality of the gas so much as might have been expected, probably owing to the absorption by the lime of some portion of the hydrocarbons. Whether this be so or not, I can state that while using nothing but Newcastle coal from the Holmside Colliery, without a particle of cannel, the gas has never been below 16 candles, and has averaged 16·5, which I attribute partly to the slow condensation, and partly to the removal of $CO_2$ by the liquor process.

Oxide, however, is not yet doomed to extinction. Within the past year means hove been perfected for the recovery from the waste material of a number of valuable products; for converting, in fact, the whole of it into money. By O'Neill's and Johnson's process the salts of ammonia are first dissolved out, then the oxide is treated, by a most effective and simple arrangement, with bisulphide of carbon, which extracts the sulphur and converts it into a marketable form. Next, a quantity of Prussian blue is abstracted by means of caustic soda, and such oxide as remains is restored to its original active condition for purifying gas. The result of these operations being that already gas can be purified for nothing, so far as materials is concerned, and, probably, in a not far distant future, the purification of gas by oxide of iron may become a considerable source of profit to gas companies.

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**The Heat of the Moon.**—The Earl of Rosse, in a recent lecture before the Royal Institution, gave some interesting information concerning the various experiments heretofore made to detect the heat of the moon, and then described his own efforts in this line, which are the latest that have been made known. By means of a specula mirror, a thermo-pile, and a pair of reflecting galvanometers, made on Sir William Thompson's plan, such as are used for sending messages through the Atlantic cable, the Earl was enabled to demonstrate the presence of heat from the moon, but the temperature of the lunar surface still remains far from being determined. My calculations, he says, lead me to estimate the heat from the moon as the 80-1000th part of that from the sun. Bouger's experiments give the brilliancy of the full moon as the 300,000th part of that of the sun. Wollaston gives it as the 80,172nd; Zollner as from 618,000th to 619,000th; and Bond as the 470,980th. The maximum of the lunar heat appears to be a little before full moon; the unequal distribution of its mountains and plains, perhaps, goes to explain this phenomenon.—*Engineer.*

# Chemical Repertory.

**No. 117.—August 2, 1874.**

**EDITOR—HENRY WURTZ.**

## CHEMICAL EXCERPTS.

1182. Tribute to Science.—Benjamin Disraeli, in a late speech at Glasgow, made the significant admission that the revolutions of science within the last fifty years have had "much more effect" in moulding the world than any political causes; and that they "have changed the position and prospects of mankind more than all the conquests, and all the codes, and all the legislators that ever lived!"—*Popular Science Monthly.*

1183. Duration of the Sensation of Sound.—Professor Mayer has proved that the residual sensation only occupies one five-hundredth of a second in the case of 40,000 vibrations per second; but in the case of 40 vibrations to a second, the residual vibration is one-eleventh of a second. He concludes that the whole ear vibrates as one mass, and the durations of these oscillations of the whole ear are far too short to remain one-thirtieth of a second. He thinks that this explains our inability to distinguish the actual pitch of sound when that pitch exceeds certain well known limits.

1184. Mine Ventilation.—The inventor of the Guibal Fan, M. Theophile Guibal, Professor of the School of Mines, Mons, Belgium, has been nominated an officer of the Order of Leopold for service rendered to the coal trade by the economy and safety produced by his ventilators for mines, now so extensively adopted in England as well as on the Continent. There are now 300 of these machines at work in England, and many others in course of construction.—*London Mining Journal.*

1185. Life Cost of Coal.—The following figures give the quantities of coal raised in Great Britain, with the loss of life which took place for each year, from 1868 to 1872:

| Date. | Tons coal raised. | Deaths. | Tons coal raised per death. |
|---|---|---|---|
| 1868 | 104,566,959 | 1,011 | 103,429 |
| 1869 | 108,003,482 | 1,116 | 96,777 |
| 1870 | 112,875,525 | 991 | 113,900 |
| 1871 | 117,439,251 | 1,075 | 109,246 |
| 1872 | 123,393,852 | 1,060 | 116,400 |

1186. Production of Light in Stones.—When various kinds of hard stones are pressed against quickly revolving grindstones, the transparent stones become pervaded throughout with a yellowish red light, like that of red hot iron. Opaque stones give a red light, at the place of contact, with halo and sparks. Dr Noeggerath thinks the phenomenon worth studying by physicists.—*Sci. Am.*

1187. Washing and Sorting Coal.—The characteristic feature of the invention of Mr. M. Evrard, of St. Etienne, Loire, is the removal from a charge of coal, after it has been emptied into a deep vessel, the bottom of which is movable and perforated, of all the various components of the same, various in size as well as in quality, without any waste or loss whatever. To obtain this result the charge is first acted on by an ascensional and intermittent current in order to drive all the fine particles to the top, then graduated fluctuations of the water are produced from the greatest height that can be usefully employed down to the smallest in order to sort the qualities. The slimy portions are next allowed to become deposited during an interval of rest, which varies from two to five minutes, according to the nature of the coal. Lastly, the washing table is raised up to the orifice of the vessel in order to effect the selection and removal of each quality.—*London Mining Journal.*

1188. Deciphering Burnt Documents.—Mr. Rathelot, an officer of the Paris law courts, has succeed

ed in an ingenious manner in transcribing a number of the registers which were burnt during the Commune. These registers had been so long in the fire that each of them seemed to have become a homogeneous block, more like a slab of charcoal than anything else, and when an attempt was made to detach a leaf it fell away into powder. Many scientific men had examined these unpromising black blocks, when M. Rathelot hit upon the following method of operation: In the first place he cut off the back of the book so as to leave nothing but the mass of leaves which the fire had caused to adhere to each other; he then steeped the book in water, and afterwards exposed it, all wet as it was, to the heat at the mouth of a *calorifere;* the water, as it evaporated, raised the leaves one by one, and they could be separated, but with extraordinary precautions. Each sheet was then deciphered and transcribed, and the copy certified by a legal officer. In this way the records of nearly 70,000 official acts have been saved. The appearance of the pages was very curious: the writing appeared of a dull black, while the paper was of a lustrous black, something like velvet decorations on a black satin ground, so that the entries were not difficult to read.

1189. An American Invention.—The Tilghman sand blast, for engraving and carving on stone, glass, etc., which is now used extensively for the making of ground glass, and for cutting bas-reliefs in marble, granite, and other stone, has been a great curiosity abroad ever since its introduction. Its effects upon the ground substance have lately been examined under the microscope by Mr. Wenham, of the British Microscopical Society, who claims to have found that the roughened surface of the glass subjected to the process was something more than a mere abrasion, being in fact composed of minute fractures produced by the impact of the particles of sand driven against it with great velocity. Even a diamond may be worn away by this battering process. A polished glass surface exposed to the blast seemed to show that a particle of glass had been driven in by each impact of a grain of sand, and that the wedge-like action thus set up had driven away the surrounding glass in small scales of fractured material. The glass, under the polariscope, was shown to be under strain and ready to yield to further fracture. This may explain the brittleness sometimes produced in glass exposed for a length of time to the action of the sand-blast, and may show that there is a limit beyond which the battering down of the surface cannot be safely carried.

1190. Rock Drilling Apparatus.—According to a recent patent of Major Beaumont, of Westminster-chambers, a number of rock drills operating by percussive action, are all worked by one single slide valve detached therefrom, and connect to the ports of all the drill cylinders by flexible or jointed pressure-pipes, so that by the motion of the slide-valve the air or gas under pressure is admitted simultaneously to, and exhausted simultaneously from, all the drill cylinders. The partial rotation of the drills at each stroke is effected by a small cylinder, supplied from the pressure pipes, actuating a ratchet in gear with a ratchet wheel on a rod from the drill piston passing through the back end of the drill cylinder. The forward motion of the drill cylinder, as the boring proceeds, is effected by a curved incline or cone on the said rod from the piston, actuating a ratchet in gear with a ratchet wheel, carried by a bracket from the drill cylinder, and fitting with a female screw on a fixed screw spindle. The screw spindle is provided with a hand wheel by which it can be rotated for drawing back the drill cylinder after the boring has been completed.—*Min'g Journal.*

1191. The Barometer and Health.—M. Bert describes new experiments on man. He went into his decompression apparatus, and caused the pressure to be reduced to 450 m. in about half an hour; it was kept between this and 408 m.m. (corresponding to heights of 4,100 and 5,100 metres) for an hour and 10 minutes; then the normal pressure was gradually restored. At 450 mm. he experienced mountain sickness; felt heavy, weak, and sick; with fatigue of sight and general indifference. On raising the right leg it was seized with convulsive tremblings, which extended to the left leg, and continued some minutes. The face was congested, etc., he was unable to whistle. But the interesting point in this experiment was this: He had taken in with him a small vessel of pure oxygen. When the pressure was 450 mm., and the pulse had risen from 62 to 84, he made an inspiration of oxygen; immediately the pulse fell to 71. It rose again to 100 on his making an effort with the spirometer, but a fresh inspiration of oxygen brought it to 70. A like result followed other inspirations. Through inhaling the oxygen the mountain sickness disappeared. These facts have lately been utilised by MM. Croce, Spinelli and Sivel in a balloon ascent.

1192. Marine Signalling.—The question of securing powerful and easily operated lights upon ocean-going vessels, and especially upon passenger steamships, is one of great importance, inasmuch as the possession of such a valuable adjunct may frequently be the means of averting a frightful disaster, of which we have lately, unhappily, had so many examples. We learn, therefore, with interest, that one of the British naval vessels has lately been furnished with one of Wilde's electric lights, which, our informant states, operates with complete success. A recent trial showed that its power was immense, and that no boat could approach it within a mile without being discovered. In a boat at 2,000 yards distant, when the beam of light was brought to bear properly, the *Times* newspaper could be read with the greatest ease. The description of the appliances is too long for reproduction here, and it need only be said that it is operated by a four horse engine, running 600 revolutions per minute, the driving power being obtained from the fly-wheel of the engine, which is employed for raising and lowering one of the steamer's guns.—*Am. Exch. and Review*

1193. Infrangible Reflectors.—Silvering mica for use in the construction of reflectors and reflecting shades by a new process, is thus described:

The mica, free from metallic deposit, is first washed in nitric acid, and then well rinsed in water, after which it is placed in vats of earthen ware. The sheets of mica are arranged back to back in pairs vertically and endwise, leaving a small space between each pair, so that only one side of each gets coated. When the mica is arranged the vats are filled with the following solution:

One ounce of nitrate of silver is placed in a bottle containing one quart of pure water, in which 1 oz. of glucose is dissolved. When the nitrate of silver is dissolved a small quantity of aqua-ammonia is added; a little more ammonia is then added, until the solution again clears. The contents of the two bottles are then mixed, and the whole poured into the receptacle containing the mica, which is then put in a warm place to encourage deposit, and when sufficiently coated is removed from the receptacle and thoroughly rinsed in water and hung up to dry, after which it may be coated with spirit varnish.—*Iron Age.*

1194. Loch Katrine Water and Galvanized Iron.—At the meeting of the Glasgow Philosophical Society, on the 1st of April, Mr. James R. Napier read a paper "On the Effect of Loch Katrine Water on Galvanized Iron." He called attention to the fact that zinc from galvanized iron goods dissolved very rapidly in Loch Katrine water, and that some warning or notice was necessary of the dangerous character of zinc coating for ships' water tanks, for domestic cooking apparatus, and for other purposes. He had accidentally made the discovery on finding the water from a galvanized iron kettle which he had made for his new cooking apparatus become quite milky after the water lay for 10 or 12 hours in it. If this arose from galvanic action, it must arise from the impurity of the zinc, as pure zinc is said by chemical authorities not to be soluble in pure cold water. The fact remained, however, that the commercial article is a very dangerous coating for domestic cooking utensils or ships' water tanks. He exhibited water in which 2½ lbs. of galvanized iron nails and other objects had been immersed for about 30 hours. The water was of such a milky color that no one would have ventured to call it pure. Pieces of a kitchen boiler were exhibited by Mr. John Norman as illustrating Mr. Napier's views. These were originally ⅜-inch thick, and had been coated with zinc by the so-called galvanizing process. The boiler had been about 12 months in use, when it had to be taken out for repair. It was then found that the zinc coating had entirely disappeared, and that the iron itself was greatly corroded.

1195. English Patent.—"Improvements in closing the joints of gas-retorts, and in the means employed therefor."—J. Wotherspoon, Glasgow. Provisional protection only obtained. Dated July 5th, 1873.

This invention has for its object to render tight the joint between the covers or lids of gas retorts and the retort proper, and consists in the employment of packing composed wholly or partly of abestos or amianthus, laid between the cover and the end or face of the retort, against which the cover is pressed or tightened in the ordinary manner. In using asbestos or amianthus for this purpose, it is plaited, braided, twisted or woven into a continuous length, so that it can be laid between the parts requiring to be made tight. It may, however, be disintegrated or teased, and mixed with water or other liquid, to form a pulp which may be spread over the joint or compressed in moulds or dies or rolled into sheets, and cut into any required shape. It may also be prepared by saturating it with acetic acid, or ammonia, or both, and alum may or may not be mixed with it.

1196. A Bold Man.—Mr. W. Cunningham Glen has been moving in the Kensington Vestry for a commission to devise means for putting the making and management of gas into the hands of the metropolitan vestries! Mr. Glen is a distinguished member of the Local Government—late Poor Law—Board. He must surely wish to introduce into the lighting of London the great principle of which his board is such a master—"how *not* to do it." Looking to the state of the things already under the London vestries—in particular scavenging and road repair—it seems a cool proposal to add gas lighting to the number. The result is less likely to be summed up in the old Latin motto, "*Ex fumo dare lucem*," than its converse, "*Ex luce dare fumum.*" Considering what average vestrymen's prose is, it is surely too much to insist on making poets of them at once, by asking them to become masters of our metres. Perhaps Mr. Glen thinks that the vestries having, in their altercations, exhausted every species of retort—except the retort courteous—they should, in fairness, have our gas-retorts to fall back upon. Gas refuse is the most offensive of all refuse. But in the case of Mr. Glen's proposition, *Mr. Punch* can only say "refuse, by all means." If the gas *does* ever fall under the domain of the vestries, *Mr. Punch* offers them a motto from Othello—"Put out the light—and then!"—*Punch.*

**"Aquation."**—Under this somewhat barbarous title a correspondent of the *Manchester Guardian* suggests a substitute for the old-new funeral rite advocated by Sir Henry Thompson, the acceptance of which is now becoming so rapidly fashionable. How the ardent advocates of the funeral pile will take this throwing of cold water upon their cherished fancy, we know not, but it carries a fitness with it and seems in keeping with the maritime instincts of our race. "The sea surrounds us," remarks the writer, "the 'dead ship' might depart daily from the strand with its lifeless burden, and reverently and prayerfully commit them to the bosom of the 'mystic main' until the time came when the sea shall give up its dead. There is no violence here. The cost would be little, the mode reverent, the effect sanitary, the condition natural, Scripture would be satisfied, and the philosopher contented." And if the proceeds of cremation would improve the harvest of the land, so would those of this method that of the sea. Or a wealthy cremationist might, after the fashion of the old Viking, have both methods combined in his obsequies, while shipowners would be provided with a market for their worn out craft instead of sinking them with their crews at the cost of the underwriters.—*Iron.*

## American Water-Gas Researches.

### REPORT OF PROFESSORS SILLIMAN AND WURTZ.

[Continued from page 26, Vol. 21]

ANALYTICAL INVESTIGATIONS.

In the present stage of progress of the art of making illuminating gas, no improvement, however highly esteemed by those familiar with it, could command serious and adequate attention from those who control this interest, without the production and presentation of proofs founded upon the most exact, complete, and consistent analytical results. Realizing this from the first, our most earnest efforts were devoted to the organization and perfection of a gas laboratory, and of apparatus and methods adapted to the complete analysis of the gaseous combinations with which we have had to deal. Chemists who know the innumerable difficulties that environ this most delicate and troublesome of all species of analysis, will understand to some extent the obstacles encountered in the improvisation of a laboratory adapted to this purpose; but these difficulties were, in practice, even much greater than we had imagined. It was even found impossible, in consequence of the entire novelty of the undertaking in this country, to procure, without great delay, the eudiometers and other apparatus requisite.* The calibration and testing of all our instruments when procured, and the elaborate tabulation of these calibrations, and the computation of the coefficients for correction of each instrument, without which most of our results would have been chaotic, consumed necessarily much additional time. The peculiarities of the case even rendered necessary the invention of new apparatus, manipulations, and methods. These will soon constitute subjects of communication through other channels, and we shall, therefore, make in this report only such incidental allusions as cannot be avoided, to these new and peculiar instruments and methods.

COMPOSITION OF THE GAS FROM THE ANTHRACITE RETORTS.

The samples analyzed were collected by attaching to apertures in the tops of the mouthpieces of the anthracite retorts an iron tube, bent at a right angle, and leading to an india-rubber bag furnished with a stop-cock. From the latter the samples were at once transferred to tubes over quicksilver. The following Table exhibits results obtained at different times in the course of our work: (See Table VI.)

The complete analyses (5 and 6) in Table VII are selected here, from many which were made, as being the latest in point of time, and, therefore, made with all our latest improvements in accuracy of manipulation. Their agreement with each other is close, and their accordance with theory is strict, as will be shown below. We present them again by themselves, with reductions into forms of greater chemical interest:

Carbonic oxide represents half its volume of oxygen; carbonic acid its own volume of the same; while marsh gas contains double its volume of hydrogen. Theoretically, of course, the total oxygen volume should be half that of the hydrogen. The ratios of the half-hydrogen to the oxygen volumes, as actually found above, are:

| | ½H. | O. |
|---|---|---|
| In No. 5 | 27·75 | 27·40 |
| In No. 6 | 27·40 | 28·36 |

We should probably remark that as the only conceivable source of nitrogen is interdiffusion through the walls of the retort with the gases of the fire space, in which latter there is little or no free oxygen, we do not allow in the calculation the volume of oxygen correspondent (as air) to this nitrogen; also that we have not calculated the hydrogen corresponding to the sulphydric acid, because in the formation of this gas from the sulphide of iron present, at least an equivalent quantity of oxygen must be consumed in oxydating the iron.

* It is to be noted that this was written more than five years ago. Matters have improved in this respect within this period.—Ed.

We present, also, in another Table (VIII) the above analyses, restricted to the three constituents which are of main interest in this connection, excluding those which must be regarded as impurities:

TABLE VIII.

| | No. 5. | No. 6. | Mean. |
|---|---|---|---|
| Hydrogen | 60·43 | 59·32 | 59.87 |
| Carbonic oxide | 35·44 | 37·14 | 36·29 |
| Marsh gas | 4·13 | 3.54 | 3·84 |
| | 100·00 | 100·00 | 100·00 |

Since the discoveries made of late years by the French chemist Berthelot, regarding the synthetical production of marsh gas from its elements, its presence in these gaseous mixtures, as indicated by our analyses, will cause no special surprise. With regard to the presence of *nitrogen*, in such appreciable quantity, we would remark that this result of the analyses clearly indicates a future improvement in the process, in the rendering of the clay retorts impermeable to gas, which, it is believed, can be accomplished without difficulty.

COMPOSITION OF THE COMPOUND ILLUMINATING HYDROCARBON GAS.

Many analyses of this were made from time to time, of which we shall present here but four, being those last made, and made, moreover, at a time when the

TABLE VI.

| Composition of Gas | (1.) Dec. 23, 1868 | (2.) Dec. 24, 1868 | (3.) D'r 29 '68 | (4.) D'r 30 '68 | (5.) F'b 11'69 | (6.) F'b 24'69 | (7.) F'b 26'69 | (8.) F'b 27'69 |
|---|---|---|---|---|---|---|---|---|
| Hydrogen | ..... | Heats high. | ..... | ..... | 48.82 | 48.96 | h'ts high | h'ts high |
| Carbonic oxide | ..... | ..... | ..... | ..... | 28.63 | 30.66 | ..... | ..... |
| Marsh gas | ..... | ..... | ..... | ..... | 3.34 | 2.92 | ..... | ..... |
| Nitrogen | ..... | ..... | ..... | ..... | 4.45 | 2.88 | ..... | ..... |
| Air | ..... | ..... | ..... | ..... | Trace. | 1.15 | 2.00 | 2.00 |
| Carbonic acid | 11.26 | 6.74 | ..... | ..... | 13.08 | 13.03 | 3.20 | 3.27 |
| Sulphuretted hydrogen | ..... | ..... | 12.90 | 12.73 | 1.68 | 0.40 | Trace. | Trace. |
| | ..... | ..... | ..... | ..... | 100.00 | 100.00 | ..... | ..... |

TABLE VII.

| Gas. | No. 5. | Hydrogen Volumes. | Oxygen Volumes. | No. 6. | Hydrogen Volumes. | Oxygen volumes. |
|---|---|---|---|---|---|---|
| Hydrogen | 48.82 | 48.82 | ..... | 48.96 | 48.96 | ..... |
| Carbonic oxide | 28.63 | ..... | 14.32 | 30.66 | ..... | 15.33 |
| Marsh Gas | 3.34 | 6.68 | ..... | 2.92 | 5.84 | ..... |
| Nitrogen | 4.45 | ..... | ..... | 2.88 | ..... | ..... |
| Air | ..... | ..... | ..... | 1.15 | ..... | ..... |
| Carbonic acid | 13.08 | ..... | 13.08 | 13.03 | ..... | 13.03 |
| Sulphuretted hydrogen | 1.68 | ..... | ..... | 0.40 | ..... | ..... |
| Totals | 100.00 | 55.50 | 27.40 | 100.00 | 54.80 | 28.36 |

TABLE IX.

| | No. 1. February 5. | No. 2. February 5. | No. 3. February 8. | No. 4. February 9. | Mean. |
|---|---|---|---|---|---|
| Hydrogen | 43.61 | 41.85 | 40.69 | 42.22 | 42.59 |
| Carbonic oxide | 7.51 | 8.66 | 10.36 | 8.31 | 8.71 |
| Marsh Gas | 33.55 | 34.16 | 33.74 | 32.26 | 33.43 |
| Illuminants | 6.45 | 6.47 | 6.21 | 6.23 | 6.34 |
| Air | 8.88 | 8.86 | 9.00 | 8.97 | 8.93 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

TABLE X.

CONTAINING THE SAME RESULTS AS IN TABLE IX, REDUCED TO 100 PARTS, WITHOUT THE CONTAMINATING AIR.

| | No. 1. | No. 2. | No. 3. | No. 4. | Mean. |
|---|---|---|---|---|---|
| Hydrogen | 47.85 | 45.93 | 44.71 | 48.60 | 46.77 |
| Carbonic oxide | 8.24 | 9.52 | 11.38 | 9.15 | 9.56 |
| Marsh gas | 36.82 | 37.48 | 37.08 | 35.45 | 36.71 |
| Illuminants | 7.09 | 7.07 | 6.83 | 6.80 | 6.96 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

TABLE XII.

| | Mean of anthracite gas of February 11th and Feb. 24th | New Haven City Gas of Feb. 11th (Westmoreland and albertite | Fair Haven Compound Hydrocarbon gas: Mean of Feb. 4th to 10th. | Calculated from Ratio of 1 of Anthracite gas, to 2 New Haven City gas. |
|---|---|---|---|---|
| Hydrogen | 59.86 | 46.79 | 50.27 | 51.15 |
| Carbonic oxide | 36.30 | 2.31 | 10.27 | 13.64 |
| Marsh gas | 3.84 | 50.90 | 39.46 | 35.21 |
| | 100.00 | 100.00 | 100.00 | 100.00 |

experimental retorts were working smoothly and uniformly, and nearly at the same time as the complete analyses of the anthracite gas above presented, so that they will be strictly comparable therewith.—See Tables IX and X.

At the time at which the samples were taken from the holder for analysis, the coal being carbonized in the bituminous retorts was the Pennsylvania Westmoreland, with 10 per cent. of albertite. At the same period gas was being constantly made, to supply the neighboring city of New Haven, from the same mixture, with, however, but from 5 to 6 per cent. of albertite, and, of course, without the water-gas. The great interest and importance, for the sake of comparison, and examination of the changes that occur, of obtaining an analysis of New Haven City gas was strongly recognized by us; and three attempts were made to transport samples to our laboratory at Fair Haven for this purpose. One of these, obtained on the 11th of February, was most fortunately successful, and the results are given below. Another analysis of a sample collected at a later date, February 25, unluckily failed for some cause to yield consistent or satisfactory figures.

COMPOSITION OF THE NEW HAVEN CITY GAS.

SAMPLE COLLECTED FEB. 11, 1869—COALS USED WESTMORELAND, WITH ABOUT SIX PER CENT. OF ALBERTITE.

TABLE XI.

| | Total contents. | Without the Air. | Without air and illuminants. |
|---|---|---|---|
| Hydrogen..... | 42.47 | 43.58 | 46.79 |
| Carbonic oxide... . | 2.08 | 2.14 | 2.31 |
| Marsh Gas..... | 46.16 | 47.42 | 50.90 |
| Illuminants..... | 6.67 | 6·86 | ..... |
| Air..... | 2.68 | ..... | ..... |
| | 100.00 | 100.00 | 100.00 |

Comparisons of an instructive character may now be made, between the composition of the compound illuminating hydrocarbon gas (as made at Fair Haven under our supervision), and the composition of its component gases, namely the Westmoreland gas (as enriched by a small percentage of albertite) and the water-gas, as proceeding from our anthracite retorts. In the first place we may present a Table in which the data are given for a precise examination into the consistency between the results of our analyses and our manufacturing results on the great scale, the latter being by far the most extensive ever yet attained in any operation of this class, while under exact scientific control. To effect this, we must necessarily throw out, in the case of each of the gaseous mixtures with which we have to deal, all constituents except those of a permanently gaseous nature; those which form the essential substratum of all illuminating gas, namely hydrogen, marsh gas, and carbonic oxide. The illuminants must be thrown out of this consideration, as they are chiefly variable components, dependent upon the fluctuating solvent and sustaining power of the permanent gases, under the variable conditions that are incident.

Our computed figures in the fourth column of Table XII, designed to show the close correspondence between the analyses and the practical manufacturing results, are founded upon the actual numerical record of the make of gas in the two gas-works, which, for each pound of the mixture of bituminous coal carbonized, average 1 during the month of February, for the New Haven Works 4.15 cubic feet, and for the Fair Haven Works 6·21 cubic feet of gas, being almost exactly 1 : 1·5, or 2 : 3.

When it is considered that the composition of the gas made at the New Haven Works rests here but upon one isolated analysis, and, moreover, that the mixtures used in the bituminous retorts at Fair Haven and New Haven were not precisely identical, the former containirg more albertite, the approximation of the figures in the 3d and 4th columns of this Table i close enough. If, instead of the mean of the four analyses of the Fair Haven hydrocarbon gas in Table IX, we compare specially the third analysis in that Table with the calculated figures, we approximate still more to the latter, at least in the content of carbonic oxide.

TABLE XIII.

| | 1. | 2. | 3. |
|---|---|---|---|
| | Actual analysis No. 3 of the Fair Haven compound gas. | Calculated from ⅓ anth. & two-thirds New Haven Gas | Col. 2 redu'd to same hyd. percentage as column one. |
| Hydrogen..... | 47.99 | 51.15 | 47.99 |
| Carbonic oxide.. | 12.21 | 13.64 | 12.73 |
| Marsh gas..... | 39.80 | 35.21 | 33.03 |
| | 100.00 | 100.00 | ..... |

On examination and comparison of the first two columns of this Table, it is apparent that the small discrepancy between the calculated and the analytical composition of the Fair Haven gas resides chiefly in the fact that the ratio of the marsh gas in the former is somewhat smaller. To show this more obviously, we have added the third column, in which the calculated percentages are reduced to the same proportion of hydrogen as in the analysis. Now when we consider that albertite contains little or no oxygen, and can therefore yield little carbonic oxide, it is only necessary to suppose (what is extremely probable on theoretical grounds) that the permanent gas, or substratum, of albertite gas is chiefly marsh gas, and the remaining discrepancy chiefly disappears, inasmuch as then the mixture which contains the most albertite must yield the most marsh gas.*

* Dana's Mineralogy, p. 753.

[To be continued.]

[Communicated by the Author.]

## Lighting and Extinguishing Gas Lamps in the Streets of Cities by Electric Agency.

Many persons are aware that the gas jets in some of our theatres and public buildings have for several years past been ignited by electricity; but comparatively few understand the mode by which this all-pervading electric force is made to display itself in the form of heat just at the point desired, and no where else: and a still smaller number comprehend the reasons why these combined subtle agents, gas and electricity, thus shown to be under our control for a convenient and useful, not to say æthetic, purpose within doors, should not ere this have been compelled to cooperate in a similar manner in the streets of our cities.

The earliest experiments in igniting a gas by electricity, were made about one hundred and twenty-five years ago by Sir William Watson, of London, who, not only fired "inflammable air" by a spark of frictional electricity drawn from a metallic conductor, but surprised the fellows of the Royal Society by kindling both inflammable air and spirits of wine by the spark from a drop of *cold water*.

Toward the end of the last century it was customary, as it is now, to demonstrate, after Cavendish, the compound nature of water by exploding in a strong glass tube a mixture of hydrogen and oxygen gases by the spark from a Leyden jar; and early in the present century, the ignition of the same explosive gaseous mixture was effected by the spark produced at the moment of separation of the two poles of a voltaic battery, then recently discovered. The first employment, however, of electricity to ignite a gas issuing from a burner was by Volta, the renowned inventor of the battery that bears his name. This ingenious philosopher devised a lamp consisting of a reservoir for hydrogen gas, with a stop-cock and burner attached thereto, and near the orifice of the latter was fixed the point of an insulated wire, which was connected by a chain with a small electrophorus forming a part of the lamp. A silken cord attached the cover of the electrophorus to the stop-cock, so that the same movement of the hand that turned on the gas raised the cover and gave the igniting spark.

At this period the common illuminating gas, now deemed almost indispensable, was hardly known, and was no where used to light the dwelling houses and streets of cities.

Between the years 1830 and 1840 the present mode of illuminating cities by gas began to be generally adopted in the smaller towns of Europe and America, though the feasibility of the project had been demonstrated, on a limited scale, in some of the streets of London as early as 1813, and in the city of Baltimore in 1820. During this same decade Faraday and Henry contributed to science the brilliant results of their researches in *induced electricity* and *electro-magnetism*, and announced the laws governing some of the most mysterious phenomena of these occult forces.

Inquisitive and inventive minds in all parts of the civilized world, by the aid of this basic knowledge, began to develop the subject, and to vary in every conceivable way the fundamental experiments; and soon electro-magnetic instruments of great power and perfection were produced. These gave long induction sparks, that were generated quite independently of the weather, which often so greatly hinders the development of frictional electricity. It was not, however, till the year 1852 that the attempt was made to utilize this new variety of electricity in connection with illuminating gas. At that time M. Du Moncel, of France, made the first practical application of this combination, and lighted a gas jet on the top of a high mast, for the Observatory of Paris. He employed copper wires covered with gutta-percha to conduct the induced current from a Ruhmkorf coil to the burner, over which the ends of the wires, tipped with platina, were brought near together, so that the spark could strike from one to the other through the jet. The gas supplied to the burner, in this case, was turned on and shut off by hand, and not by electric agency. It seems there had been, as yet, no attempt made to ignite several jets of gas at the same time by electricity of any kind, though, as will be referred to further on, the possibility of lighting the gas lamps in the streets of a city by this means, had been *suggested* some years before.

In order to obtain a clear idea of this subject of gas lighting by electricity, it will be necessary to glance backward at some of the first principles of electrical science. In the year 1729, Stephen Gray, a fellow of the Royal Society, London, discovered that some substances would conduct electricity, whilst others would not, or at least imperfectly. This was an enormous stride forward, because it disclosed the means by which electricity could be retained in a body, and also how this force produced at one place could be made to manifest its peculiar effects at another distant place. Gray's discovery was the very foundation of all our present practical applications of electricity, for none of them would be possible without the knowledge of this fundamental fact, that bodies can be classified into *conductors*, and *insulators* or non-conductors, of electricity. All the metals, water, acids, animal bodies, and many other substances, are conductors; but each substance has a conducting capacity peculiar to itself and different from the others. Glass, silk, resins, gutta-percha, air, and many other bodies, are insulators or non-conductors of electricity, and these also vary as to their insulating capacity, none of them being perfect in this respect. Metals are the best conductors, but the best of them are far from conducting electricity perfectly, and there is a marked diminution of the power of an electric current which is caused to traverse any considerable length—even a few hundred feet—of metallic wire. This diminution is due to several causes, but when care is taken to insulate the conducting wire, chiefly to a conversion of a part of the electricity into heat, which being distributed throughout the whole wire is generally so slight at any one spot as to produce no sensible rise of temperature. According to modern notions, heat and electricity being only different modes

of motion will be converted into each other. The amount of heat developed by a given electric power in a conductor of given length, depends on the thickness of the conductor and the substance of which it is composed; the best conductors being the least heated. Copper is one of the best conductors known, and platina, amongst the metals, ranks very low in conductivity; hence when wires of these two metals of equal size are joined together in alternate lengths, and a current from a galvanic battery is sent through the compound wire, the platina portions ought to become warmer than the copper portions, and this is actually the case. Now, by reducing the comparative thickness and length of the platina portions, the current remaining the same, the heat may be so much increased in these portions as, simultaneously, to raise them to incandescence, or even to melt them, whilst the intermediate copper parts of the wire will not be perceptibly warmed.

It is thus apparent that here is one ready means of developing by electricity, heat sufficient to inflame a jet of illuminating gas at any distant point or points we may desire, provided the number of points and the distances be not too great; for, as above remarked, the strength of an electric current is rapidly diminished by the length of the conducting wire under the most favorable circumstances, and in this case, when a number of great resistances are interposed in the circuit, the current is much more enfeebled, and the evolution of heat consequently lessened. There is, therefore, a practical limit to this method of lighting gas, though it is one of those successfully used in buildings. In these instances the platina wires, which are unoxidizable, are usually in small spiral coils, arranged one over each burner, and partly immersed in the sheet of gas when it issues forth. The electricity is turned on and off at pleasure by moving the handle of a "switch," which makes or breaks the connection of the wires with a galvanic battery. The gas is also admitted to the burners, and shut off from them by means of a single stop-cock attached to the gas pipe with which all the burners communicate. Both the "switch" and stop-cock are moved by hand. In the dome of the Capitol at Washington, the gas is ignited by this means. The burners and platina wires are arranged in sections of about twenty in each, and these sections are lighted, successively, by the great battery in an adjoining room, after the gas which has been turned on at the principal pipe has had time to flow to the different burners.

Another mode of lighting numerous gas jets is by the electric spark, which is the sudden passage of an electric current through an aeriform body producing heat, light, and sound. The electricity that produces a spark is of very high tension—that is, it moves with much greater velocity than the ordinary current from a galvanic battery, and hence possesses peculiar powers. This high tension electricity is generated chiefly by friction and by "induction," or the *influence* from a passing current in an adjacent conductor. It has little quantity, but great penetrating power, and might be compared to a bullet shot from a rifle, if a galvanic current were likened to a large stone thrown by hand. In igniting coal gas by this means the sparks leap between the points of two wires that are brought together, but do not touch, at the orifice of the burner. The heat of the spark is sufficient to cause the ignition of the gas when this is combined with the air, but if the spark-points be entirely immersed in the *pure* gas, unmixed with atmospheric air, no inflammation will ensue when the spark passes, because *pure coal gas* is not an explosive compound, and a lighted candle introduced into an inverted jar full of such gas, is as effectually extinguished as if dipped into water. When the gas is mingled with a certain proportion of atmospheric air, or oxygen, it is readily and powerfully explosive. A large number of burners may be connected together by wires whose points are placed as above described, and the current from a frictional electrical machine, or from an "induction coil," can be sent through the whole line, so as to light all the gas jets simultaneously. In this case it will be seen that the wire connecting together any two burners is quite independent, and has no metallic connection with any wire, but the electric circuit is completed by the spark. The sparks are prevented from striking, except where designed, by the circuit wire being insulated throughout its length by a covering of gutta-percha, or india-rubber. The gas jets by which the Senate Chamber of the United States is illuminated are ignited by electric sparks, and in some theatres from fifty to a hundred jets are lighted at one flash by this means.

[To be concluded.]

# Correspondence.

[Correspondents, in all cases, should sign their communications with their names and address in full—not necessarily for publication, but as a guarantee of good faith.—Ed.

### An Enthused Gas-Man.

July 21st, 1874.

Mr. Editor: In your last issue, in an article taken from another paper, there is mention made of what I conceive to be one of the most brilliant discoveries of the age; and, strange to say, you pass it over in silence, you make not a single comment upon it—an invention of the greatest possible interest to the gas world and to the public; and one that, in my opinion, ought to have occupied the foremost place at the late meeting of the Gas-Light Association, yet, as far as I can learn, not a word was said about it!

I allude to that article taken from the Shamokin *Herald*. It appears that the people of this celebrated city (for it will be renowned for all time as being the first place to recognize and adopt this invention) are about to have gas, and the city council, in their wisdom, make it a condition that the only meter which shall be used, is the one that shall register the gas consumed *in dollars and cents!* That they have such a meter there is certain, for the article referred to, after expressing grave doubts as to the accuracy of the meter now in use, goes on to say: "Whereas the dollar and cents meter can easily be tested by each consumer at pleasure," so that this wonderful meter will not only tell to a fraction the amount of gas consumed in dollars and cents, but the consumer is in a position to know that his gas bill is correct and just.

Happy day, when we get those meters fixed; no more explanation, no more doubt. We will with joyful steps take round our monthly gas bills to a smiling, happy, contented, people.

Where and who is this inventor—this benefactor? Perhaps, like all truly great men, he is modest. Publish his name to a grateful, admiring public. Let us give him a place in the gas-temple of fame, beside Clegg, Malam, Wright, and other worthies. I have looked through the advertisements in vain for the manufacturer of those meters. I will try again.

Yours joyfully,
GASMAN.

### Gas from Crude Petroleum.

ADRIAN, MICH., July 13th, 1874.

Mr. Editor: I have noticed in your Journal articles by correspondents on gas made from crude petroleum. I have had some experience with petroleum gas which may be of interest to your readers. I erected a small set of gas works last fall, for the Northwestern Insane Hospital, near Toledo, Ohio, on the Gearing process, superheated steam and air. The furnace and retorts are capable of producing 500 cubic feet per hour, using fifty feet of retorts, heating length, which the gas passes through continuously. The practical results are that five gallons of oil will produce 1000 feet of gas of 18 candle power. I use three feet burners and produce a fine flame, free from smoke or soot, use no purifiers other than a thorough washing. There is but a small condensation after it passes into the holder. There was no condensation in the pipes during last winter, which were laid in the ground and exposed, as other street mains are, to frost. They were completed in December last, and have been in successful operation up to this time, giving the best of satisfaction, as the copy of Dr. Wright's letter enclosed will fully endorse. For institutions remote from gas works already erected, there is nothing that can compete with gas made from crude petroleum; and as to the cost for the amount of light obtained, cheapness of constructing the works, and the safety in the manufacture, especially where parties have their steam-boilers in use daily.

NORTH WESTERN INSANE HOSPITAL,
B. A. WRIGHT, M. D., SUPT.,
TOLEDO, OHIO, July 8, 1874.

Col. J. J. Newell—

Dear Sir: In reply to yours of the 1st inst., I will say that I am pleased to state that we have continued to use the gas works you erected for the Northwestern Insane Hospital since December last, with the following result, viz., we fill our holder, which has a capacity of something over 500 cubic feet, with fine fixed gas, using from 2 to 3 gallons of crude petroleum in its manufacture. When the heat of the furnace is good, two gallons is all sufficient, we obtain as much light with a 3 feet burner as is commonly obtained from a 5 feet burner, when coal gas is burned.

Respectfully yours,
B. A. WRIGHT.

The above is a true copy of Dr. Wright's letter.

Respectfully yours,
J. J. NEWELL.

### A Disclaimer.

ALBANY, N. Y., July 29, 1874.

Mr. Editor: In the account of the proceedings of the Gas-Light Association of the United States, reported in your Journal of July 2nd, the following statement is made relating to the of the Gibson Valve, by the People's Gas-Light Company of this city.

"The average yield to date, as compared with the average yield in dip-pipe seal during the past year, being more than 9 per cent. in favor of the valves."

As the valves in question are still on trial by this company, and no proper test have as yet been made by said company, of their efficiency, you will see that the above statement is erroneous.

Very truly yours,
H. Q. HAWLEY, President.

## Petroleum Engines.

The Philadelphia *North American* quotes, apparently from a British source, the following, which is of course far more applicable to us than to the Britishers:

"Vienna has created a new demand for petroleum, and one that is likely to increase. A company has organized there for the manufacture of a patent petroleum engine that is absolutely safe from the dangers of explosion; that will start and stop instantly; that occupies little space, is noiseless, requires no heating, and will do as much work as any at less cost. That is the engine apparently that the world wants. If it lacks something, it possesses so much that the deficiency can be calculated of short duration: so much, according to the account, that its introduction is certain without addition or alteration. There is hardly a feature of the ideal engine that is not ascribed to this patent.

"The engine creates an increased consumption of petroleum as soon as its merits are finally established. Considerable as this must be on the continent, the very fact that introduces the engine there is the one that would naturally give it quick introduction and general use in Great Britain. The rivalry between the two countries depends greatly upon a cheap and efficient motor, and France and other countries have an interest in the problem. If Vienna can furnish all that is intimated in the announcement, even though this does not reach to many horse power, the company are likely to declare frequent dividends. The petroleum interest is certain to find a tonic, and interests of many kinds and of great weight will find various consequences."

## English Gas-Patent to an American.

IMPROVEMENTS IN MEANS OR APPARATUS FOR MANUFACTURING AND STORING ILLUMINATING GAS.—MARCH 5, 1873.—J. C. TIFFANY, PORTSMOUTH. UNITED STATES ARMY.

This invention relates, firstly, to improvements in the arrangement and construction of furnaces and retorts for manufacturing illuminating gas from oils, hydrocarbons, and other similar substances, whereby the heat of the furnaces shall be most economically employed, and the gases evolved may be subjected more thoroughly to the action of the heat of the retorts, more thoroughly purified, and at the same time economy effected in the wear and tear of the retorts. Secondly, the invention relates to improvements in gasometers or gasholders for the storage of illuminating gas.

In carrying out the first part of the invention a furnace is so arranged as to contain in its interior a fire chamber constructed of fire-brick, between which and the walls or shell of the furnace a non-conducting material is placed, also a peculiar arrangement of heated air chamber and means of supporting the retort.

The object of the second part of the invention is to produce a gasometer or gasholder composed essentially of a stationary bottom plate and a movable head or crown, to which are attached flexible curtains of india-rubber cloth or other fabric rendered impervious to gas and air, and consists in attaching the fabric constituting the curtain or body of the gasometer to the bottom plate and movable crown or head by means of annular bands, links, or rods, which compress or clamp the fabric between the edges of the plates and said bands for forming an air and gas tight joint.

The invention also consists in applying to the flexible curtains or body of the gasometer a series of loops or eyes travelling on stationary guide-rods on the receiving frame for maintaining a true shape of the gasometer when expanded by the gas, and for preventing uniform crimping of the same when in a collapsed state.

The invention also consists in making the bottom of the gasometer with a concave or corrugated upper surface, forming a receptacle for collecting tar or any condensable matter that may pass the purifiers or condensers.

The invention also consists in applying to said concave bottom a series of rods or a wire gauze or perforated diaphragms for preventing the curtain or body of the gasometer, when in a collapsed state, from coming in contact with the condensed matter collected in the concave bottom.

The invention also consists in the employment of one or more syphon tubes applied to a concave or corrugated bottom for the escape of the condensed material, and for preventing the entrance of the external atmosphere into the gasometer.

The invention also consists in constructing the movable crown or head of the gasometer partially of a skeleton frame or metallic rims, and a flexible covering attached by the same clamping bands or fastening devices, which secure the flexible body or curtain in position.

The invention also consists in attaching to the interior or exterior of the curtain or body of the gasometer a series of strengthening hoops for preventing an inward or outward collapsing of the curtain so as to retain the form of the gasometer.

## Cost of Gas Manufacture.

A recent number of the *Pall Mall Gazette* gives an account of the elaborate operation rendered necessary by the English laws in order to increase the price of gas. The Imperial Company were originally entitled, by their act of incorporation, to charge three shillings and nine pence per thousand feet for their gas, say in round numbers ninety cents gold, and they applied for permission to make an addition of one shilling and a penny, in order to enable them to pay dividends of ten and seven per cent. respectively to their two classes of stockholders. The law provides that the Commissioners, appointed by the Board of Trade to pass upon such applications, shall give such an illuminating power and such a price as shall yield to the company, "with due care and management," a dividend up to the limit fixed by the charter. The application was grounded on the high price of coal, and the company submitted their accounts for the past year, and made an estimate for next year's expenditures and income. Their application was opposed in the interests of the consumers by the Metropolitan Board of Works, and the inquiry resolved itself into an examination of what was meant by "due care and management," whether it referred to the extension of the company's works and the outlays for successive years, or was limited to the business of the current year. Arguments were heard on both sides, after the company had put in evidence all the facts in reference to its expenditures; and on the other side proof was submitted that much of this was unnecessary, and the new capital was not raised on as economical terms as might have been obtained· the opinion of the law officers of the Crown was taken on certain points in the construction of the acts, and finally a decision was given with great solemnity. In a memorandum accompanying it there is a statement of the financial position of the company for the coming year, showing the total sum required to pay dividends at ten and seven per cent., and interest on loans, as well as the amount due the sinking fund. The net income being less than the sum required to pay the dividends claimed, the company was allowed an addition of 11d. on the price of gas, 2 pence less than that claimed by them. When it is remembered that, in addition to this elaborate machinery, which must be put in operation to secure an advance of a quarter of a dollar or less in the price of gas, there is a law completely regulating the standard of the light itself and all the details of its preparation, distribution and payment, it will be seen that the consumers in London are better protected than in cities which boast of their self-government. An act of Parliament passed in 1871 prescribes in great detail the conditions binding both the gas producers and the gas consumers, who, by the way, in addition to the price of gas, pay rent for the meter, which, is let by the company; the illuminating power of the gas is strictly regulated, and the tests are to be applied by a paid and impartial expert, who is to be appointed either by the municipal government or by competent local judicial authority; the purity of the gas is also to be tested, and the penalties—up to twenty pounds—can be enforced as well for a violation of the law in this as in other particulars. Under such regulations it is not surprising that the London gas companies supply their customers with good and cheap gas and manage their business with due care. Perhaps the English system may err on the side of too much caution, but that is no shortcoming in our own Philadelphia Gas Works or the management of corporations throughout the country. —*Phila. Ledger.*

**The Gas Machine Controversy.**—AN IMPORTANT PATENT RIGHT DECISION.—Judge Woodruff, in the U. S. Circuit Court, at New York, has recently filed his opinion sustaining the patent of the Gilbert & Barker Manufacturing Company, on the Springfield Gas Machine, and directing a perpetual injunction against the Tirrell Underground Gas Machine. This decision establishes the exclusive right of the Gilbert & Barker Manufacturing Company to place the carburetter of the machine underground, outside of the building to be lighted, and operating in connection with an air pump, and that all machines using similar devices are infringements, and their use is liable to be enjoined.

Stanley, Brown & Clarke for complainants: Wetmore & Jenner for defendants.

## Advertisers Index.

☞ In looking for advertisements, see figures 1 to 12, within brackets, at head of advertisement pages.


### GAS BURNERS, APPARATUS, ETC.

American Meter Co.—West 22nd st., N. Y., Arch and 22d st., Phil., 23 West st., Boston.....11
Agency for the Gibson Improvement—W H. Grenelle, 42 Pine street, N. Y.....10
Cast Iron Gas and Water Pipe—S. Decatur Smith, York and Meyer streets, Phila., Pa.....8
Cast Iron Gas and Water Pipes—R. D. Wood & Co., Philadelphia Pa.....10
Cast Iron Gas and Water Pipe—Jno. McNeal & Sons, Burlington, N. J.....8
Franklin Foundry and Pipe Works—Jas. Marshall & Co., 23 Nineteenth street, Pittsburgh, Pa.....2
Gas Valves (Chapman) 75 and 77 Kilby St., Boston, Mass.....3
Gas-Burners—C. Gefrorer, 259 Commerce st., Phil'a Pa.....9
Gas Purification—St. John and Cartwright.....5
Gaylord Iron and Pipe Company—90 and 92 Broadway, Cincinnati, Ohio.....9
Gas Meters, etc.—Harris, Griffin & Co., 12th and Brown streets, Phila., Pa.....10
Gas Meters, etc.—Wm. W. Goodwin & Company, 1012 Filbert street, Phila, Pa.....11
Gas Meter Manufacturers—Harris & Bro., 1117 Cherry st., Philadelphia, Pa.....11
Gasometers, Etc.—Geo. Stacey & Co., Cincinnati, O.....5
Gas Fixtures, Etc.—Mitchell, Vance & Co., 597 Broadway.....7
Gasholders, Etc.—Delly & Fowler, 39 Laurel st., Phila., Pa.....2
Gas and Water Pipes—B. S. Benson & Son, 68 B'way., N Y.....5
Gasometers, &c.—Keystone Iron Works—2132 Filbert st., Philadelphia.....2
Gas Screens—American Gas Screen Manufacturing Co., Haverhill, Mass.....4
Jersey City Gas Meter Works, 14 Morris st., Jersey, N. J.....8
Lime Hurdles.—Manhattan Lime Hurdle Co., Geo. W. Day, Treas., No. 3 Railroad Square, Haverhill, Mass.....2
Lava Tips and Scotch Tips—Charles H. Meyer & Co., 227 Chestnut street, Phil. Pa.....8
Middletown Tube and Iron Works—Thos. R. Brown, 25, 27 and 29 North 20th street, Phila., Pa.....8
National Tube Works Co., 78 William St., N. Y.....7
Patent Conically Slotted Wood Trays—John L. Cheesman, 147 and 149 Avenue C., N. Y.....4
Patent Gas Exhauster—Smith & Sayre, 95 Liberty street..4

### GAS COALS.

Cannelton Coal Co. of West Virginia—J. Tatnall Lea, 315 Chestnut street, Phila, Pa.....3
Despard Coal Co.—Parmelee & Bros., Agents, 32 Pine st., New York.....7
Gas Coals—Bird, Perkins & Job, 27 South st., N. Y.....7
Monongahela Gas Coal—56 Exchange Place, Baltimore, Md. 6
New York and Cleveland Gas Coal Company—384 Penn Avenue, Pittsburgh, Pa.....6
Ohio Gas Cannel—G. Merryweather, Pine cor. Wm. sts., Peytona Cannel Coal—S. E. Low, 58 Broadway, N. Y.....5
New York.....3
Red Bank Mining Company—Bird, Perkins & Job, 27 South st., N Y.....7
Sterling Coal—Freeman Butts, Cleveland, Ohio.....6
The Newburg Orrel Coal Co.—Chas. W. Hays, Agent in New York, Trinity Building, 111 B'way, Room 7.....6
Tyrconnell Gas Coal—52 S. Gay Street, Baltimore, Md.....6

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Atlantic Dock Iron Works—John P. Kennedy, Office 98 Liberty street, N. Y., P. O. Box 2348.....9
Cast-Iron Pipes and Fittings—B. S. Benson, 52 East Monument street, Baltimore, Md.....5
Continental Works—T. F. Rowland, Greenpoint.....6
Camden Iron Works, Camden, N. J.—Jesse W. Starr & Sons 5
Gloucester Iron Works—J. P. Michellon, Sec., 6 North 7th street, Phila., Pa.....2
National Foundry and Pipe Works—Wm. Smith, Carroll, Pike, Smallman & Wilkins streets, Pittsburg, Pa.....6
Pascal Iron Works—Morris, Taskar & Co., Philadelphia....12
Providence Steam and Gas Pipe Co., Providence, R. I.—H. A. Branch, Agent.....3

### WATER METERS, PUMPS, ETC.

Cast Iron Pipes for Water and Gas—Riley A. Brick, 112 Leonard street, N. Y.....10
Valves for Water, Steam and Gas—Ludlow Valve Man'g Co., 940 River street, Troy, N. Y.....6
Water Pipes, etc.—S. Fulton & Co., 412 Walnut st., Phila....7

### CLAY RETORT WORKS.

B. Kreisher, Clay Retorts, etc., 58 Goerck st., New York....8
Cheltenham Fire Brick and Clay Retort Works—Evens & Howard, 916 Market street, St. Louis, Mo.....6
Jersey City Fire Brick Works—J. H. Gautier & Co., Greene, Essex and Bergen sts., Morris Canal Basin, N. J.....8
Lacle le Fire Brick Works, 107 North Levee, St. Louis, Mo..8
Manhattan Clay Retort Works, 15th st., near Av. C, N. Y..8
Philadelphia Fire Brick Works, Vine and 23d sts., Phila....8
Retorts, Etc.—Geo. C. Hicks & Co., Baltimore Md.....

### LAMPS, STOVES, PETROLEUM, ETC.

Patent Lamp Post—J. W. Graham, Chillicothe, Ohio, or A. M. Callender, office of this Journal.....9

### MISCELLANEOUS.

Analysis and Testing of Gas Coals—Prof. Henry Wurtz, 12 Hudson Torrace, Hoboken, N. J.....10
Architect and General Gas Engineer—William Farmer, 111 Broadway Room 95.....8
American Gas Works Construction and Supply Company—61 Broadway, N. Y.....3
Cements—S. L. Merchant & Company, 76 South st., N. Y...7
Contractors for Gas Works, Etc.—Murray & Baker, Fort Wayne, Ind.....2
Gas Engineer—H. E. Chollar, 914 Olive St., St. Louis, Mo...6
Gear Wheels—Scott, 98 Chambers St., N. Y.....5
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Massachusetts Institute of Technology—Samuel Kneeland Boston, Mass.....3
National Coal Gas Company—H. P. Allen, 4 Warren street New York.....6
Retort Setting and Working—E. S. Cathels, Montreal, Can. 8
Retort Setting and Fitting—Robus, Simpson & Robus, 1 Robb's Block, Susan Street, Montreal, Canada.....2
School of Mines, Columbia College, East 49th st.....9
Screening Shovels—O. R. Butler, 126 Maiden Lane, N. J....7
Scientific and Practical Chemist and Geologist—Profetsor Henry Wurtz, 12 Hudson Terrace, N. J.....2
Works upon Gas—D. Van Nostrand, 23 Murray street and 27 Warren street, N. Y.....9
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MONDAY, AUGUST 3, 1874.

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**CONTENTS.**

☞ An asterisk (*) denotes an illustrated article.

British Association of Gas Managers..... 41
Chemical Excerpts. ..... 42
Aquation..... 43
Am. Water Gas Researches..... 44
Lighting and Extinguishing Gas-Lamps in the Streets of Cities by Electric Agency..... 45

CORRESPONDENCE—
An Enthused Gas Man..... 46
Gas from Crude Petroleum..... 46
Petroleum Engines..... 46
English Gas Patent to an American..... 47
Cost of Gas Manufacture..... 47
The Gas Machine Controversy..... 47

EDITORIAL—
Earth-Closets..... 48
The New Petroleum-Development in California..... 48
The New Geological Survey of Pennsylvania..... 48
Petrolioducts: The Right of Way..... 49

## EARTH-CLOSETS.

This so-much belauded invention has never been approved of by us, for the reason chiefly that we cannot see how there can be any certainty involved of the destruction of the germs of diseases, which may become pent up in the mass of earth, and develop disastrously at some future period. The inventor, the Reverend Henry Moule, has of late renewed his notoriety, combined with some ridicule, by some greatly vaunted discoveries regarding gas-production from a material known in England as "Kimmeridge shale," which it appears he has been experimenting on with grand results for many years *in secret*. His results, such as are realizable, are pronounced to be destitute of novelty altogether.

This Reverend Gentlemen has also recently advocated what the *London Mining Journal* says is practically the substitution of chalk for coal. He confesses his ignorance of chemistry, excusing it on the ground that he has never found time for either chemical or scientific research. No one is likely to impugn this excuse. The Reverend Mr. Moule (this name should not be pronounced mule, which would not be respectful to the cloth) heats his church with a mixture of anthracite and chalk in equal quantities, and finds that the fire lasts, and continues to develop heat, for a much longer time than without the chalk. The magnitude of his discovery is now obvious to all. We would but hint at the effect of inhalation of the dust from such a fire.

To return to the earth-closets, it turns out now in practice that the grand point that has been made, for this plan, that the fertilizing power of the *excreta* is preserved, whilst made void of offense, is like to come to naught. E. C. C. Stanford, an English chemist of note in sanitary matters, says that he finds—and, moreover, that in so finding he merely confirms the results of others—that such "mixtures of nitrogenous matters with earth rapidly and continuously lose nitrogen," and that nitrification does not take place. He finds but one-fifth as much nitrogen in the earth after repeated use as calculation would require.

Exactly how the nitrogen goes off is what is not yet clearly understood, as it would appear. We have our opinion on this subject, which we may develop on another occasion. The fact we now have to present is merely that the earth-closet, as it left the hands of its inventor, has doubtless "gone up," unless some *chemist* will take it in hand, and improve the plan, so that the manurial advantages which have been fallaciously counted on, should really be made to follow.

## THE NEW PETROLEUM DEVELOPMENT IN CALIFORNIA.

This subject, while of more or less general interest to all, we harp on in some measure, as we have before said, because it is pleasant to find the opinions of Professor Silliman on the resources of the Pacific in mineral oil confirmed to the full, after all the vituperation which was heaped on him in connection with the subject, through the machinations of those who foisted upon him, as a scapegoat, the obloquy which was due to their own wolfish schemes to defraud the public—in which, as those who were to some extent behind the scenes say, they stuck at nothing, however dishonorable.

We now learn from the San Jose *Mercury* that "the oil deposits of San Buenaventura County are inexhaustible, and when developed to anything approximating their full extent, will constitute one of her chief sources of wealth. At present there is but little demand for the oil, and the shipments do not exceed 200 barrels per month. This amount is shipped by R. G. Suydam, who furnishes it to the Central Pacific Railroad Company for lubricating purposes. There being no sale for the oil all operations have been suspended, and immense quantities of it now run from the tanks down the mountain sides, forming great pools in the gulches below. The source of all this oil is supposed to be in Sulphur mountain, which derives its name from sulphur springs in the vicinity. It is found in a stratum of shale and in localities easy of access. With a reasonable expenditure the various oil works of the county could be made to produce almost any desired quantity, which we doubt not will be done as soon as the demand will warrant. The oil can be delivered at the wharf for one dollar per barrel. A considerable amount of asphaltum is also found in the oil regions. With the development of the oil resources, the business of San Buenaventura will receive a new impetus."

The Los Angeles *Express* also states "that the new refinery is in successful operation at Petroliopolis; that seven barrels of refined illuminating oil had been sent to that city for trial, and the fluid pronounced superior to the imported article. A Mr. Spangle, a gentleman of great experience in the oil region of Pennsylvania, has been here for some time examining our oil resources. He has made a careful examination of the San Francisco oil range, and pronounces it superior to the Pennsylvania region. He says that, for the work done in our range, the developments are extraordinary, and far surpass, in encouragement, anything he ever saw at so early a stage of work in the East. He believes that the oil vein or lagoon is much more ample and extensive than we have now any idea of. The active manner in which our oil men are starting in, to turn their interest to productive account, justifies the hope that when our several refineries are well under way we shall soon supply all the illuminating and lubricating oils used west of the Rocky Mountains. We have a region of oil capable of turning out more crude material than has yet been tapped in the Pennsylvania region. The Los Angeles wells will, in a few years, divide the consuming world with Pennsylvania, and from us will come the illuminating fluid used on this entire Pacific slope, the islands of the ocean, and in the almost illimitable markets of Asia and Australia. Pennsylvania will hardly be able to compete with us in these markets."

## THE NEW GEOLOGIAL SURVEY OE PENNSYLVANIA.

With regard to this important work we learn that the survey is fully organized, and the parties are already at work in the field. Prof. Lesley, the State Geologist, has, however, found it necessary to go to Europe, to save time, by procuring at once special instruments required. He will be gone, however, but a few weeks. We are informed that the bituminous coal measures of Clearfield and Jefferson counties will be studied by Mr. Franklin Platt, assistant. He will begin with the formations on each side of the principal lines of railroad. He will have with him as aid, Mr. Richard M. Saunders, and as volunteer aids, Messrs. H. J. Fagin and Chas. A. Young. Mr, Saunders is at work on a special survey of Morrison's Cove.

We also learn that the oil regions of Butler Clarion and Venango counties will be surveyed by Mr. John F. Carl. As aid he will have Mr.

F. A. Hatch. He will spend the season principally in collecting accurate data for assigning the strata their exact position beneath the surface. The amount of this work required there is large.

Andrew S. McCreath has been appointed chemical assistant, with headquarters and laboratory at Harrisburg. To this laboratory the specimens collected will be sent for analysis and distribution. Especial attention will be given to economical work, since that has heretofore been almost totally neglected. Iron ores and coals will be thoroughly studied. All persons having interesting specimens may forward them to Harrisburg, where they will be examined if of importance.

The rooms of the Commission in Harrisburg will at preeent be used, in addition to their proper use, to form the nucleus of a complete geological and mineralogical museum of the State.

Our readers of the gas profession have therefore held out to them the prospect of important additions in due time to our knowledge of the superabundant gas coal formations of Pennsylvania.

## PETROLEODUCTS: THE "RIGHT OF WAY."

It is now some time since we began, among the first, to urge the institution, on the largest scale found practicable, of oil ducts to bring petroleum from the wells or the producing districts, to centres of population and trade and, to navigable waters. Much progress has been made in this direction now, and one of the most important and extensive operations, so far, is what is called the "Columbia Conduit Co.," of Pittsburgh, whose aim it has been to lay a three inch pipe, which we believe is some forty miles in length, from the Butler and Clarion oil-field to the former city. Among the directors of this enterprise we find the name of Dr. Hostetter, President of the Pittsburgh Gas-Light Company; as well as those of Messrs. McElroy and McClelland, Engineer and Treasurer of the same Company. It would seem therefore to be closely bound up with the Pittsburgh Gas-Light Company. We refer to the subject now in connection with a curious and unexpected complication that has developed therefrom. We do not know, however, why it should not have been expected. Railway corporations in this country, have never been troubled much to find pretexts for maintaining, by hook or by crook, their exclusive rule or control of every interest in the country of which they take possession. In this case, however, the curiosity is in the peculiar shape of their claim. We learn from the Harrisburgh *Patriot*, that the West Pennsylvania Railroad, across whose track the petroleoduct must pass, take the ground that they have the *right of way*, and have *torn up*—from three feet under ground—the pipe where it crosses their track!

The motive is clear enough; to prevent interference with their assumed or asserted monopoly to transport oil, or rather to regulate the price at which oil shall be transported, thus controlling the oil market. We ask, are the people of the United States going to submit to any such outrageous doctrine? The same principle would apply were the use of gas for fuel, for example, to be carried out, in any city, on a large scale, so as to interfere with the market for coal controlled by any particular railroad monopoly. They might tear up the gas-pipes where they chose to locate their tracks. Carried to extremes, the railroads might claim the privilege to carry *water* to supply cities, in water trains, and abolish aqueducts!

The *Patriot* says that it is possible that this railroad opposition to a harmless and beneficent public enterprise may be nothing more than the customary trick of "the law's delay," the railroad company in the meantime profiting by the freightage which the pipe line would deprive it of. The right of the people of the oil region to get to market, in the cheapest possible way, should be conceded. They have spent millions of dollars in developing this industry until it has reached almost the first place in our foreign exports. The railroads have profited by this more than any other single interest in the country To interpose their right of way against the use of a new and cheap means of transportation, defrauds the consumer entitled to the cheapest transportation he can get.


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An examination of the merits of these inventions as demonstrated by practical experience in a large number of Gas Works employing them, will not fail to convince the intelligent Gas Manufacturer of the great advantages derived from their use.

Gas of unexceptional quality, of high illuminating power is made at many of these works by these processes, at a cost of from 40 per cent. to 60 per cent. less than an ordinary qualito of illuminating gas can be made by any other methods in use. Gas Companies generally may easily, and at small outlay for making the necessary changes in manufacturing apparatus, double their net earnings, and supply a much better light to their patrons, at greatly reduced prices.

The Company respectfully refer to Companies using these processes in this city, Brooklyn, Newark, Chicago and elsewhere, and especially to the Mutual Gas-Light Company of Detroit, Mich., whose works more nearly conform in all details of construction to the original plans of the inventors, than those of other Companies.

For correspondence, etc., address to office as above.

JOSEPH M. WARD, Secretary.

P.P. DEILY, J. FOWLER.

*1842.* *1874.*

## DEILY & FOWLER,

39 LAUREL STREET, PHILADELPHIA, PA.,

*Builders of Gas Works.*

MANUFACTURERS OF

## GAS-HOLDERS,

*Single and Telescopic.*

WROUGHT IRON ROOF FRAMES,
COAL WAGONS,
COKE BARROWS,
AND ALL

## Wrought Iron Work

CONNECTED WITH GAS WORKS.

☞ Particular attention paid to Extensions and Repairs.

## ROBUS, SIMPSON & ROBUS,

(Late of the CRYSTAL PALACE DISTRICT GAS WORKS, London, England, and the NEW CITY GAS WORKS, Montreal, Canada.)

CONTRACTORS FOR

## Retort Setting and Fitting, and Main Laying.

☞ Retorts set on what is known as CATHELS'S PLAN FOR SETTING RETORTS.

Retort Setters sent to all parts of Europe and America. Address

C. SIMPSON, 1 Robb's Block, Susan Street, Montreal. or F. & H. ROBUS, Bell Green, Lower Sydenham, Kent, England.
355-6m

## RILEY A. BRICK & CO.,

MANUFACTURERS OF

## CAST IRON PIPES,

FOR WATER AND GAS,

ALSO,

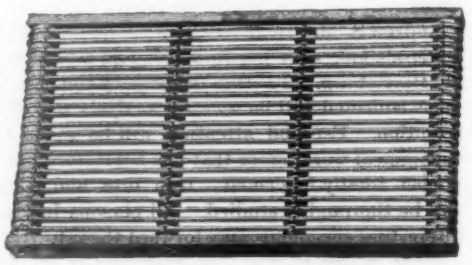
**GAS WORKS AND MACHINERY CASTINGS**

OF EVERY DESCRIPTION,

**No. 112 Leonard Street, New York.**

RILEY A. BRICK, JAS L. ROBERTSON

## THE MANHATTAN LIME HURDLES.



The most satisfactory results ever produced by any device used for supporting slaked lime, for the purpose of purifying coal gas.

## 6,800 CU. FT. OF GAS PURIFIED PER BUSHEL OF LIME.

These Hurdles combine, as no other device has, *Extreme Porosity*, with Lightness, strength, and durability.

Their *entire cost will be saved* in one seasons use, in preventing carbon accumulations in the retorts, and in allowing the *entire* body of lime to be of service.

Gas Light Companies before ordering elsewhere will find it for their interests to give these Lime Hurdles, or supports, their consideration, and a trial will substantiate the above.

We shall deliver for six months, these Lime Hurdles, or supports, to most any point in the United States, free of Freight charges.

## THE MANHATTAN LIME HURDLE CO.

HAVERHILL, MASS.

GEORGE W. DAY Treasurer, Office No. 3 Railroad Square

## GAS WORKS FOR SALE.

IN A FLOURISHING TOWN ON THE PACIFIC COAST. A rare opportunity for the purchase of a very desirable property.

For particulars address "SUPT GAS CO." Lock Box 30 Santa Cruz, Santa Cruz Co., Cal. 360-6m


### PRICES OF FOREIGN AND DOMESTIC GAS COALS.

[Reported Expressly for this Journal.]

July 18, 1874.

DELIVERED IN NEW YORK.

| | | | |
|---|---|---|---|
| **English Cannel.** | | | |
| Ince Hall | $17 00 | @ | 18 00 |
| Kirkless Hall | 16 50 | @ | 17 00 |
| **English Caking Coals.** | | | |
| Newcastle Gas | $12 00 | @ | 00 00 |
| Liverpool caking | 11 50 | @ | 12 00 |
| **British Province Coals.** | | | |
| International—At Sydney, $2 50 in gold | | | — — |
| Block House—At Mines, $2 12, Gold | | | 0 00 |
| Caledonia—At Mines, $2 00, Gold | | | 0 00 |
| Little Glace Bay—At Mines, 2 00, Gold | | | — — |
| Lingan—At Mines, $2 30, Gold | | | 0 00 |
| Reserve (Sydney) $2 25, Gold | | | 0 00 |

(Duty, 15 cents per ton, gold. Freight to New York $2 50, currency. Cost of above coals delivered in New York, $5 50 @ $6 00, currency.)

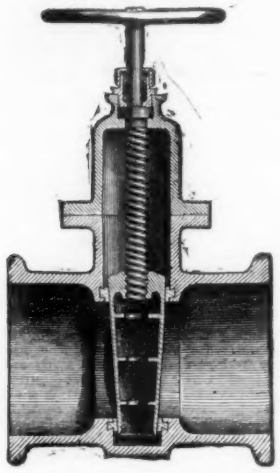
| | | | |
|---|---|---|---|
| **Pennsylvania Coals.** | | | |
| Penn Gas Coal—At Amooy | $7 00 | @ | 0 00 |
| Westmoreland—At Amboy | 7 00 | @ | 0 00 |
| (In New York both the above coals $7 50) | | | |
| Shafton | 7 50 | @ | 0 00 |
| Youghiogheny | 7 75 | @ | 0 00 |
| **West Virginia Coals.** | | | |
| MurphyRun | $7 40 | @ | 0 00 |
| Despard | 7 40 | @ | 0 00 |
| West Fairmont | 7 40 | @ | 0 00 |
| American Gas Coal | 7 40 | @ | 0 00 |
| Fairmont | 7 40 | @ | 0 00 |
| Newburgh Orrel | 7 40 | @ | 0 00 |
| Pinnickinick | 7 40 | @ | 0 00 |
| Cloverhill of Virginia | 6 00 | @ | 6 50 |
| McKenzie Compound Mixture | | | — — |
| **American Cannel Coals.** | | | |
| Peytona of West Virginia | $12 50 | @ | 00 00 |
| Darlington of Pennsylvania | | | — — |
| Cannelton Cannel | | | 12 50 |
| **Asphalts.** | | | |
| Albertite of New Brunswick | $— 00 | @ | — 06 |
| Ritchie Mineral of West Virginia | 18 00 | @ | at Balt'e. |
| Trinidad Bitumen | — — | @ | 14 05 |

# CHAPMAN VALVE COMPANY.

MANUFACTURERS OF

# CHAPMAN GAS VALVES.

**Office and Sales Room 75 and 77 Kilby Street, Boston.**

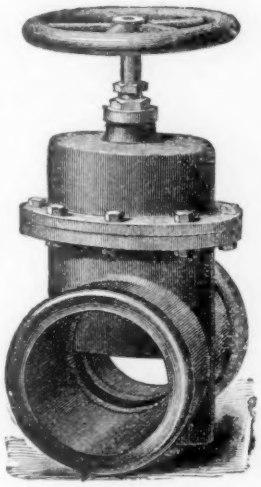


These Valves have been in use for several years, and are pronounced by all who have used them to be

***The Best Gas Valves Ever Made.***

They afford a direct passage the full size of the pipe. The seats are made of an alloy similar to BABBITT metal, specially prepared for the purpose, and superior to all other metals used for the seats of Gas Valves. It does not corrode under any circumstances to which it is exposed.

There is NO LIABILITY OF COHESION between the Gate and Seat, and the Valves can be relied upon to SHUT TIGHE and OPEN EASILY at all times—an important desideratum when used for street mains, in cases of fire.



We refer to the following named Gas-Light Companies among the many that have used these Valves:

BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CAMBRIDGE GAS-LIGHT COMPANY, CAMBRIDGE, MASS.
NEWTON & WATERTOWN GAS-LIGHT CO., WATERTOWN, MASS.
LAWRENCE GAS-LIGHT COMPANY, LAWRENCE, MASS.
PEOPLES GAS-LIGHT COMPANY, BROOKLYN, N. Y.
CITIZENS GAS-LIGHT COMPANY, BROOKLYN, N. Y.
SOUTH BOSTON GAS-LIGHT COMPANY, BOSTON, MASS.
CHARLESTOWN GAS-LIGHT CO., CHARLESTOWN, MASS.
LYNN GAS-LIGHT COMPANY, LYNN, MASS.
FITCHBURG GAS-LIGHT COMPANY, FITCHBURG, MASS.
CITIZENS GAS-LIGHT COMPANY, NEWARK, N. J.
WILLIAMSBURGH GAS-LIGHT CO., WIRLIAMSBURGH, N. Y.

GAS AND WATER VALVES ½ INCH TO 36 INCHES DIAMETER.
STEAM VALVES ½ INCH TO 12 INCHES DIAMETER.
357-tf

## CANNELTON COAL COMPANY

***Of West Virginia,***

Offer to Manufacturers of Gas the pure Cannel Coal from their Colliery at Cannelton, West Virginia. This coal after having been thoroughly tried by the most expert and reliable Engineers, has shown itself to be the most valuable **Enriching agent** produced in this country—a gross ton yielding **10,000** cubic feet of gas, of **64.54** candle power, to purify which, required only two bushels of lime. The yield of coke is **32 bushels** of good quality, quite light, burns freely, making a very hot fire. For further information address

J. TATNALL LEA, Treas.,
P. O. Box 1747. No. 325 Chestnut Street, Phil'a.

## PEYTONA CANNEL COAL

**From West Virginia.**

Yields over **13,000** feet of Gas per ton. At ten thousand feet (standard yield) the illuminating power is over **43** candles. Purifies **4,510** feet to the bushel of lime.

S. E. LOW, Secretary,
354 Office, 58 Broadway.

## MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

Entrance Examinations June 1 and 2, and Sept 23 and 24. For new Catalogue and late Entrance Examination Papers apply to PROF. SAMUEL KNEELAND,
255-12t Secretary, Boston, Mass.

PROVIDENCE

## Steam & Gas Pipe Co.,

**PROVIDENCE, R. I.,**

BUILDERS OF

**Coal and Rosin Gas Works,**

FOR TOWNS AND MANUFACTORIES.

Estimates furnished of the cost of Works, and cost to Manufacture Gas in any Locality.

**Gasholders,**
**Iron Truss Retort House Roofs,**
**Water Tanks,**
**Purifier Covers,**
**Coke Barrows,**
**Cast Iron Socket Pipe.**

Particular attention given to Enlarging and Re-building Gas Works.

For Lighting Manufactories, our Rosin Gas Works have been successfully used for *many years* past. They require but a small outlay, and afford a *safe* and *economical* light.

FOR SALE AT MANUFACTURERS PRICES:

EXHAUSTERS AND COMPENSATORS,
IRON AND CLAY RETORTS,
FIRE BRICK, CLAY AND TILE,
ROMAN CEMENT AND ROSIN,
STATION AND CONSUMERS' METERS.

REFER TO

Manufacturers' Gas Co., Fall River, Mass.; Youngstown Ohio, Gas Co.; New Rochelle, N. Y., Gas Co.; Homer and Cortland, N. Y. Gas Co.; Danbury, Conn., Gas Co.; North Bridgewater, Mass., Gas Co.; Cold Spring, N. Y., Gas Co., Rockville, Conn., Gas Co. Taunton, Mass., Gas Co.; Pawtucket, R. I., Gas Co.

FREDERICK GRINNELL, President, J. C. HARTSHORN, Treas,
S. MILLETT THOMPSON, Secretary.

Office and Manufactory, corner of Pine and Eddy Streets, Providence, Rhode Island.

Office in Syracuse, N. Y., No. 1 Granger Block.

**H. A. BRANCH, Agent.**

AMERICAN

# GAS WORKS CONSTRUCTION AND *Supply Company.*

President—JAMES A. TAYLOR, Columbian Iro Works.

Engineer—A. F. HAVENS, late of Brooklyn Ga Light Co, Patentee of the following inventions:

**HOISTING ENGINES,**
**COAL ELEVATORS,**
**WIRE-ROPE RAILROAD,**
**TRAYS FOR LIME OR IRON**
**RETORT CHARGING AND RAKING MACHINE,**
**RETORT SETTINGS,**
**SELF-SEALING LIDS,**
**AUTOMATIC DIP-PIPE SEAL**
**SECTIONAL PURIFIERS.**

The above Patents are the result of many years experience and are of great value, enabling any Company to increase the capacity of its Retort and Purifying Apparatus 15 to 20 per cent without change, and at slight cost.

Plans, Specifications, and Details furnished of all Apparatus, and Companies supplied with every thing required in Gas Manufacture, from the greatest to the least, at the lowest market rates.

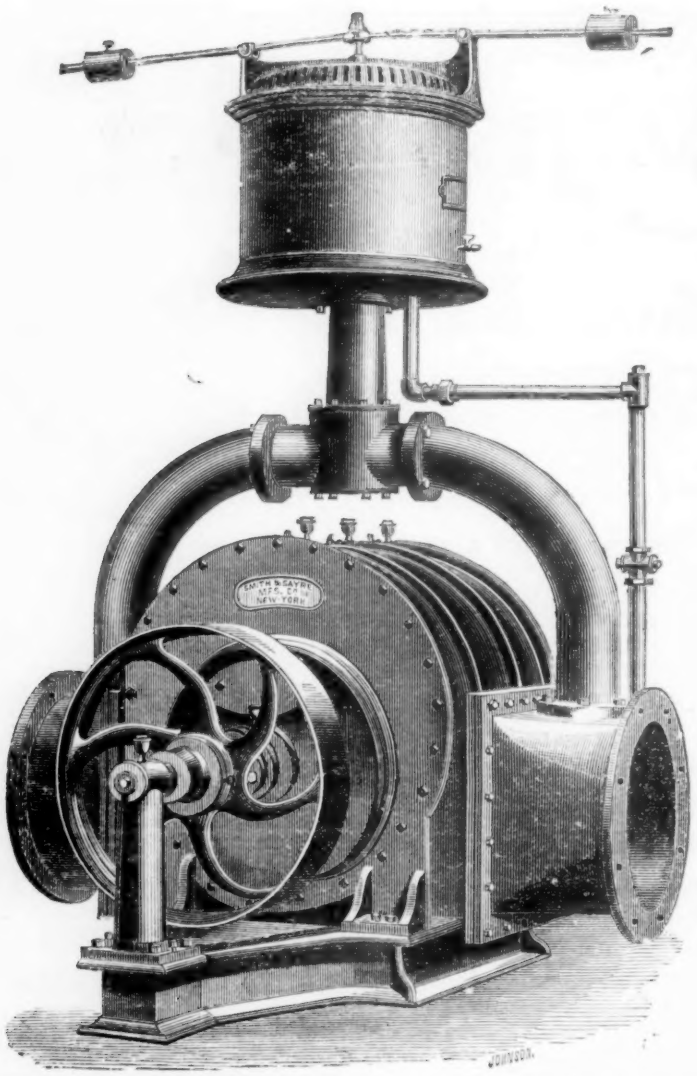
**American Gas Works Construction and Supply Company,**
**No. 34 Dey St., N. Y.**

☞ Mr. HAVENS can be consulted on all matters appertaining to Gas and its manufacture, gratis.

SMITH & SAYRE MANUFACTURING COMPANY.

# The Mackenzie Patent Gas Exhauster

**And Patent Compensator.**



They are made to pass from 4,000 to 150,000 cubic feet of gas per hour; will increase the production and illuminating power of the gas, and add very much to the durability of the retorts, either clay or iron. The Compensator obviates entirely the necessity of water-joints, is compact, durable, cleanly, not liable to get out of order, self-acting, quiet, and certain in its operation.

They are also sole proprietors and manufacturers of the

**MACKENZIE PATENT BLOWER, PATENT CUPOLA AND SMELTING FURNACE.**

The Blower is a Force Blast machine, durably built, and can be driven with one-third the power required to drive the ordinary Fan. The Cupolas are manufactured in sizes to melt from 1 to 90 tons per hour, will save one quarter of the time required by the old style Cupola, and 33 per cent fuel. Address

CHARLES W. ISRELL, Secretary. JAMES M. SAYRE, Treasurer. G. G. PORTER, President.

OFFICE, 95 LIBERTY STREET, New York.

AMERICAN

## GAS SCREEN MAN'F'G COMPANY.

### TO GAS-LIGHT COMPANIES.

Your attention is respectfully called to the GAS SCREEN now being manufactured by the American Gas Screen Manufacturing Company, under the patents granted to E. DUFFEE, and are pleased to submit the following points of their excellence and superiority over all other screens now in use.

The Screen is made with an oak frame, interlaced with split rattan, drawn through holes at regular intervals in the Frame and cross-pieces, the edges of the frame being grooved to prevent abrasion.

The advantages of the screen are:

1st. The large purifying surface, the construction of the Screen giving over three-fourths of the surface for the gas to penetrate the lime.

2d. On account of the free passage of the gas through the screen the pressure is reduced, thereby preventing the accumulating of carbon on the retorts.

3d. The saving of lime and labor, as the Screens are not liable to clog, and are easily cleaned.

4th. Their cheapness and simplicity of construction.

5th. Their DURABILITY—they can be used longer than any other now used.

**Testimonials.**

PROVIDENCE, RHODE ISLAND, March 21st, 1872

E. DUFFEE, Esq., Agent, etc.

Dear Sir: The Trays manufactured by you for our West Station were put in use in September last, and have *given perfect satisfaction.*

The frames are well put together, and I see no reason why they will not last for a long time. The *very large amount of* open space in these Trays gives the gas an easy passage, and brings it into contact with the lime much better than when the space is so contracted, as is the case in most of the other Trays in use.

The pressure thrown upon the retorts by contracted passages is very great, and were gauges used more frequently than they now are in many gas-works, this facat of having *open Trays* would become more apparent to mangers of gas works. The digerence in pressure at this station in passing the gas through your purifiers, is two-tenths (2-10) inches.

The amount of gas purified, per bushel of lime used to this date, is six thousand five hundred and fifty six (6,556) cubic feet.

Respectfully yours,
JAMES H. ARMINGTON, Supt.

BOSTON GAS-LIGHT CO., Dec. 1871.

Dear Sir: In answer to your inquiry how we like your Patent Tray for dry gas purifiers, I take pleasure in saying we have used them exclusive of all others, for the last three years, and think them far ahead of any yet offered. The surface being nearly three times that of any other Tray, and their lightness and durability perfectly satisfactory.

Yours respectfully,
A. M. GILES.

EDWARD DUFFEE, Esq.

EAST BOSTON, JUNE 15, 1871.

Gentlemen: We have used your Screens some five years. They give perfect satisfaction.

I consider them *by far the best Screen* for Dry Lime Purifiers I have seen. Yours truly, A. M. NORTON, Supt.

CHELSEA, May 1, 1871.

Mr. E. DUFFEE.

We are using your Purifying Trays, and find them to be the *best of any* that I have used, and will *purify more gas with less pressure* than any tray that I know. I can fully recommend them, after four years trial, to any Gas Superintendent with perfect safety, as the *cheapest and best Tray made.*

Yours truly, JOHN ANDREW, Sup't.

DORCHESTER, March 3, 1870.

Mr. E. DUFFEE.

Dear Sir: We have had your Gas Trays in constant use for almost one year and six months and find them superior to any others we have ever used, both in point of economy and efficiency. Truly yours, W. B. BROOKS,
Agent Dorchester Gas-Light Co.

JAMAICA PLAINS, MASS., June 21, 1871.

EDWARD DUFFEE, ESQ.

Dear Sir; The Trays ordered by this company three years ago, are getting somewhat worn. I wish to say here that I consider your Trays to be superior to any yet invented, therefore please make us another set at the price named, to be like the sample shown in every way, and oblige Yours truly
JAMES F. ROGERS,
Sup't Jamaica Plains Gas-Light Co.

BROOKLINE, June 11, 1871.

E. DUFFEE, ESQ.

Dear Sir: You will please make a set of Gas Trays for this company as soon as convenient, at price named. In regard to the merits of the Tray, after having them in constant use for over two years, I will say that I consider them *superior to any Tray* manufactured in this country. Respectfully yours,
H. A. ALLYN,
Sup't Brookline Gas-Light Co.

BANGOR, August 2, 1870

EDWARD DUFFEE, ESQ.

Dear Sir: Yours of the 20th ult. is received. In regard to your Gas Trays, I take pleasure in saying that they have been in use over two years, and have given perfect satisfaction and they are in good order at the present time; should have no hesitation in recommending them, believing they are the most durable and easiest kept in order of any with which I am acquainted. Respectfully yours,
W. H. PERRY, Sup't.

OFFICE OF THE SPRINGFIELD GAS-LIGHT CO.
SPRINGFIELD, MASS., Oct. 10, 1871.

MR. WARD,
President Hartford Gas-Light Co.

Dear Sir: I have been using Gas Screens made by the American Gas Screen Company, for nearly a year, and find them superior in every way to the wooden Screens made and formerly used by the Springfield Gas-Light Co. I can purify more gas with the same quantity of lime, there being more surface to the Screens; and I consider them more durable, and recommend them to your consideration.

Yours with great respect,
GEORGE DWIGHT

ROXBURY, June 14, 1872.

EDW. DUFFEE, ESQ.

Dear Sir: In answer to your inquiry regarding your Patent Gas Screens, I am happy to be able to say, that after nearly three years constant use we are perfectly satisfied with them being able to purify over fifty pet cent. more gas with them than with any other Screen we have used.

Yours respectfully,
THOMAS J. PISHOU

OFFICE DETROIT GAS-LIGHT CO.,
DETROIT, MICH., April 22, 1872.

AMERICAN GAS SCREEN MANUFACTURING CO., HAVERHILL.

Gentlemen: The Screens bought of you work far better than any we have ever used. As a proof, we have with the same quantity of lime purified *twenty per cent.* more gas with your Screens than with any others, and the work well done. The workmen are also better pleased with them—they being light and handy to work. They also relieve the pressure very much upon the retorts, and I cheerfully give yau my experience. Yours truly,
P. E. DEMILL, Secretary.

We give a list of some Gas-Light Companies using them.

Providence, R. I. Gas-Light Co.. Boston, Mass. Gas-Light Co.: East Boston, Mass., Gas-Light Co.; South Boston, Mass. Gas-Light Co.; Springfield, Mass., Gas-Light Co.; New Bedford, Mass., Gas-Light Co.; Manchester, N. H., Gas-Light Co.; Reading, Penn., Gas-Light Co.; Biddeford, Me., Gas-Light Co.; Hartford, Conn., Gas-Light Co.: New Haven, Conn., Gas-Light Co.; New Orleans, La., Gas-Light Co.; Savannah, Ga., Gas-Light Co.; Charleston, S. C., Gas- Light Co.; Trenton, N. J., Gas-Light Co.; Charlestown, Mass., Gas-Light Co.; Dorchester, Mass., Gas-Light Co.; Chelsea, Mass., Gas-Light Co.; Baltimore, Md., Gas-Light Co.; Manhattan, N. Y., Gas-Light Co.; Cincinnati, Ohio.; Gas-Light Co.: San Francisco, Cal., Gas-Light Co.: Albany, N. Y., Gas-Light Co.; Sacramento, Cal.; St. Joseph, Mo., Gas-Light Co.; Leavenworth, Kansas, Gas-Light Co.; Macon, Ga., Gas-Light Co.; Roxbury, Mass., Gas-Light Co.; Lansinghburg, N. Y., Gas-Light Co.; Bridgeport, Conn., Gas-Light Co.; Stamford, Conn., Gas-Light Co.; Poughkeepsie, N. Y., Gss-Light Co; Scranton, Penn., Gas-Light Co.; Lewiston, Me., Gas-Light Co., and one hundred others.

Address **H. A. POTTER, Treas.,**
Amer. Gas Screen Man'f'g Co., Haverhill, Mass.
EDWARD DUFFEE, Agent.

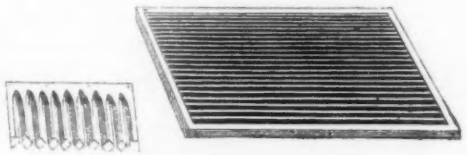
## J. L. CHEESMAN.

MANUFACTURER OF

**Patent Conically and Diamond Slotted**

**SOLID WOOD TRAYS.**

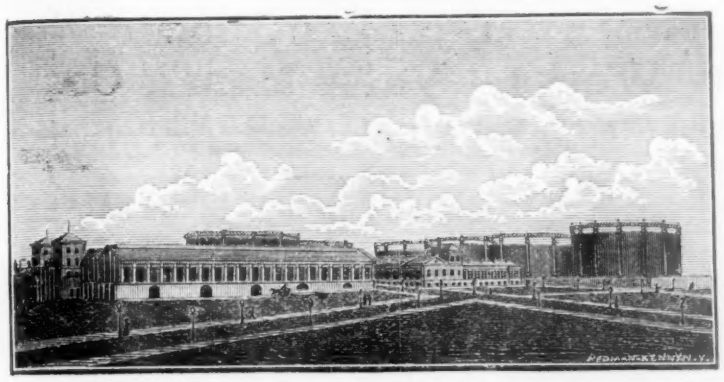
PATENTED OCTOBER 21, 1862 AND JUNE 10, 1873.



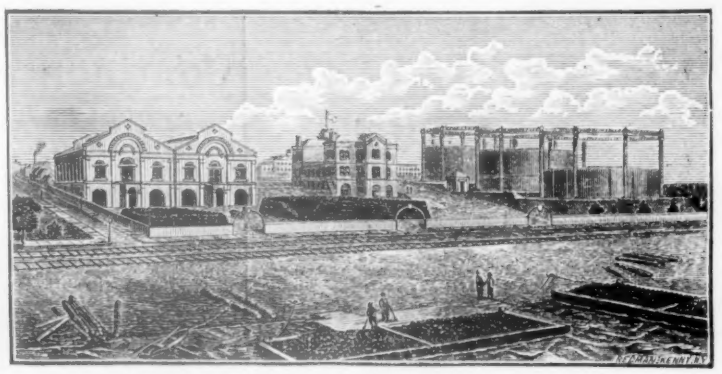
## To Gas Companies.

The above Trays will last longer. and are cheaper than any Tray now used. They are now made without any outside strips, which gives more purifying surface, being perfectly smooth. The lime will not adhere to them as in other Trays. They are now used in over three hundred Gas Companies in the United States, and other places.

JOHN L. CHEESMAN,
151 and 153 Avenue C, New York.



CINCINNATI GAS-WORKS. ERECTED 1871-72-73.—WM. FARMER, ENG.



LACLEDE GAS WORKS, ERECTED 1872.—WM. FARMER, ENG

# WILLIAM FARMER,

## ARCHITECT AND GENERAL GAS ENGINEER,

**111 BROADWAY, TRINITY BUILDING, Room 95, New York.**

WILLIAM FARMER may be consulted upon all matters connected with the construction of GAS WORKS, or any other description of buildings. Will furnish General and Detail Drawings, Specifications and Estimates for Gas Works of any capacity.

PATENTEE OF THE FOLLOWING INVENTIONS:

**Exhausters for Gas and Foul Lime Ventilation,**
**Dumping Barrows for Coal, Coke and Lime,**
**Hydraulic Mains for Retort Benches,**
**Blowers for Forges, Foundries, &c.**
**Pumps for Water, &c., &c.**

REFERENCES:

Professor SILLIMAN, New Haven, Conn.
GEN. CHAS. ROOME, President Manhattan Gas-Light Company, N. Y.
A. W. BENSON, President Brooklyn Gas-Light Company, Brooklyn, N. Y.
W. W. SCARBOROUGH, President Cincinnati Gas-Light Company, Cincinnati, Ohio.
S. L. HUSTED, President Laclede Gas-Light Company, St. Louis, Mo.
Prof. HENRY WURTZ, EDITOR AMERICAN GAS-LIGHT JOURNAL, N. Y.
GEN. A. HICKENLOOPER, Vice-President Cincinnati Gas-Light Co., Cincinnati, Ohio
FREDERICK CROMWELL, Vice-President Laclede Gas-Light Company, St. Louis, Mo.
C. VANDERVOORT SMITH, Engineer Manhattan Gas-Light Company, N. Y.
JAMES R. SMEDBERG, Consulting Engineer, San Francisco Gas-Light Co., Cal. [342

## GAS PURIFICATION.

### St. John and Cartwright's
### NEW IRON COMPOSITION

Has purified, per bushel, on a single test, 10,000 feet of Westmoreland Gas. With revivification lasts indefinitely. Surpasses in POWER and ECONOMY all known materials. Saves largely in FIRST COST, SPACE, LABOR, SUPERINTENDENCE, and all current expenses. Will purify *easily* sulphurous gas, wholly *unmanageable by lime.* Takes out *all the ammonia.* Now operating in the following Gas Works: Harlem, New York (21st street); Port Morris; Hunter's Point; East New York Worcester, Lynn and Cambridge, Mass.; Lewiston, Maine; St, Albans, Vt.; Pawtucket, R. I.; Meriden, Ct.; and being introduced in many other places.

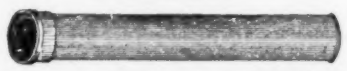
Cost 70 cents per bushel. One bushel for each square foot of Purifier sufficient. Rights to use for life of Patents, for daily makes of gas in thousands; under 25,000 $200; under 50,000, $400; under 100,000, $500; $250 additional for each additional 50,000 per day.

For further information and instructions, apply to
ST. JOHN & CARTWRIGHT,
21st Street and Avenue A, New York Gas Works.

☞ Immediate arrangements are urged, as the demand for the prepared composition is increasing *so rapidly* that delays in supply may occur.

## B. S, BENSON.

MANUFACTURER OF



### Cast Iron Pipes and Fittings,

AND

### Gas and Water Mains.

All sizes from 3 to 30 inch cast vertically in 12½ feet lengths

**Office & Factory 52 East Monument St.,**
BALTIMORE, MD.

## OHIO GAS CANNEL,
### From the Sterling Colliery.

We are now prepared to place in the market, through our agents as below, a regular and unlimited supply of this valuable Cannel, for gas purposes. The analysis made in 1871 by Prof. WURTZ, Editor of this Journal, at the Laboratories of the NEW YORK GAS-LIGHT COMPANY, gave 47⅞ per cent of Volatile Matter and 45 bushels to the ton of a fair quality of coke. The yield of gas was at the rate of 9,500 feet per ton of about 27 candle power. It is not highly sulphurous, can be purified by Lime, and the ash from the coke does not clinker. The above test has been fully substantiated as correct, and can confidently recommend trial of the coal.

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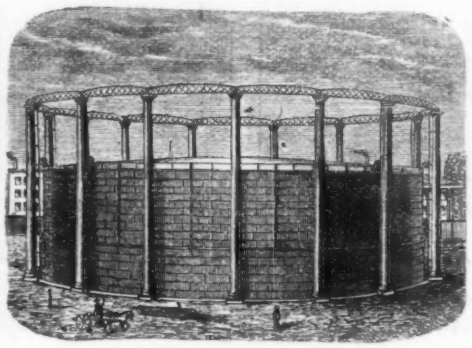

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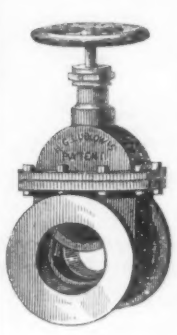

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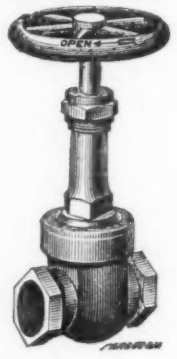


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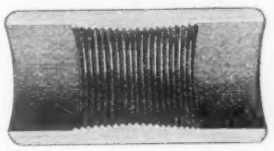

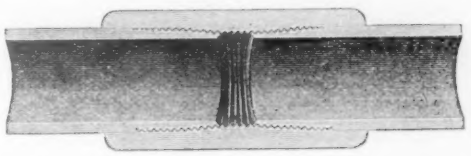

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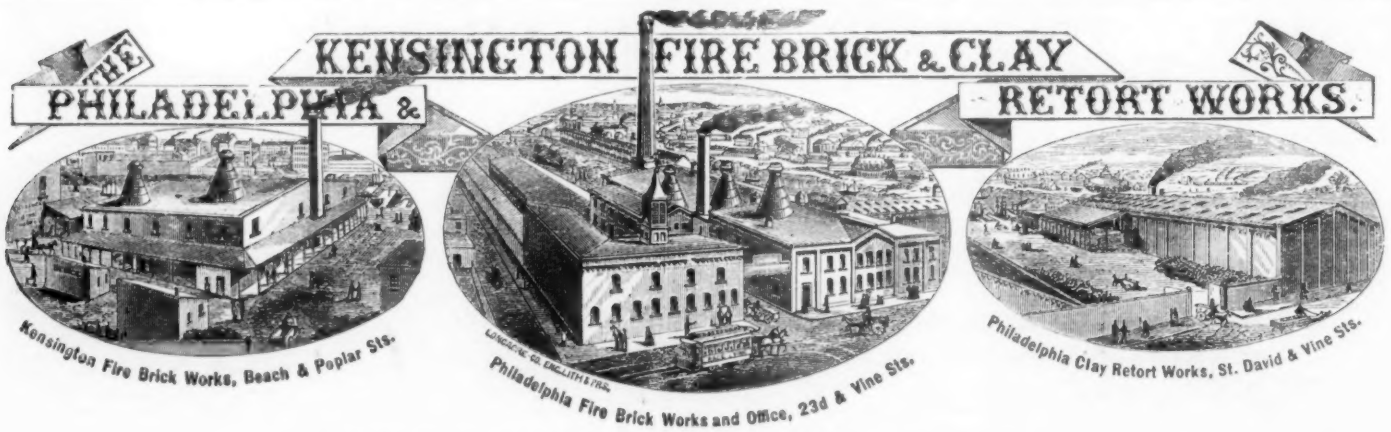
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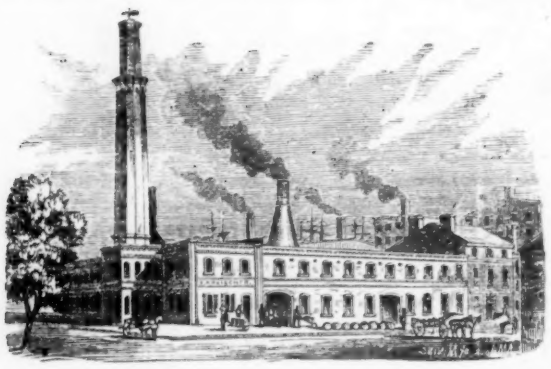

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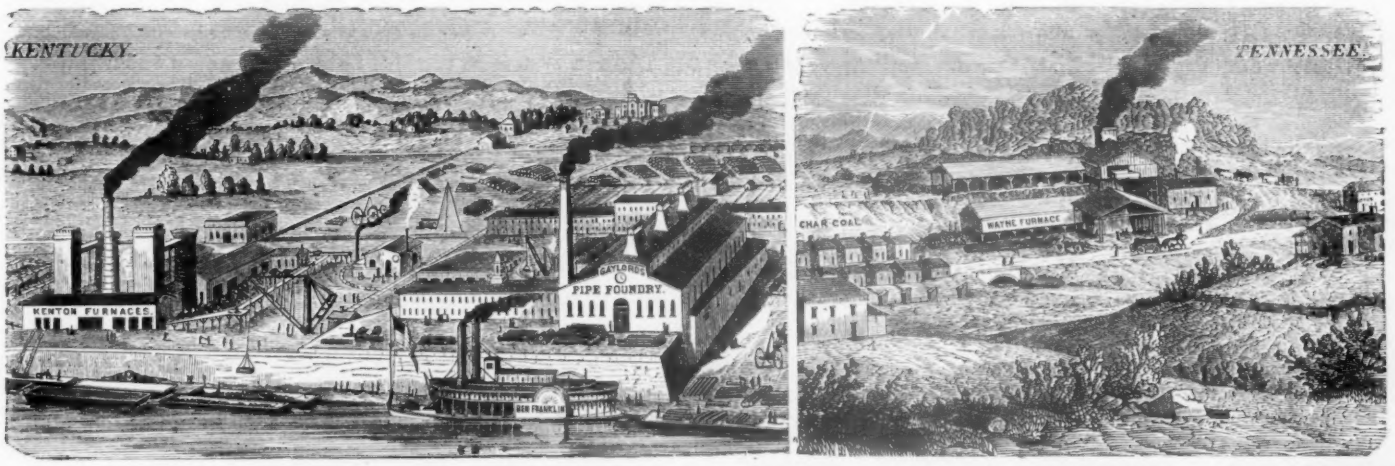


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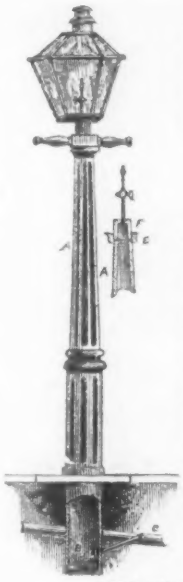

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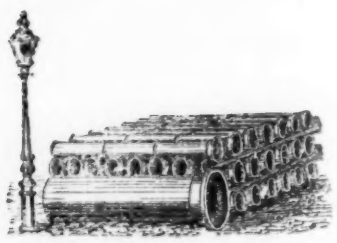

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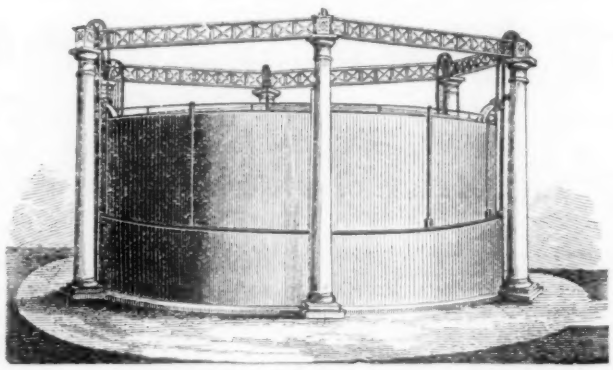

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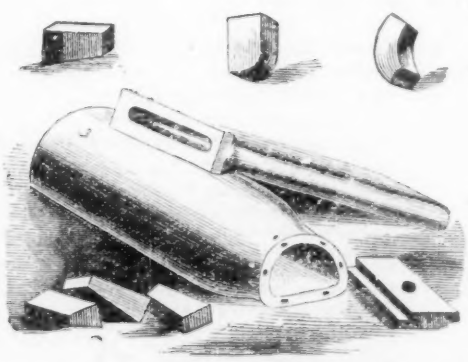

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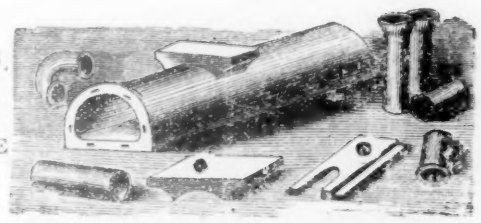

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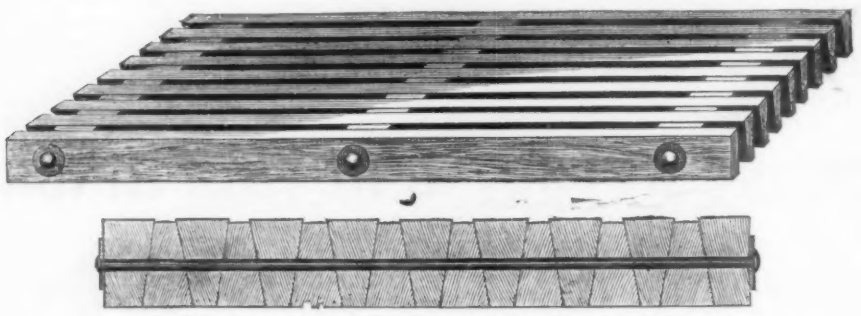

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